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## ADVANCES IN THE PREVENTION AND TREATMENT OF CONTAGIOUS DISEASES OF CHILDHOOD*


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CONTRIBUTIONS to the field of contagious disease prevention and treatment have become more numerous than ever during the past decade. Although a detailed knowledge of these is desirable, the scope of this article is limited to presenting a condensed survey of accumulated data focused on certain practical conclusions regarding a subject which is of such vital importance.

Statistical analysis of mortality rates in the State of Minnesota shows a general decline in the deaths from the more common diseases of childhood since 1915. A study in the allocation of mortality by age groups, however, reveals the fact that the deaths from diphtheria, scarlet fever, measles and pertussis in the pre-school age have remained practically unchanged during this period. A great deal of publicity has been given to immunization, hygiene, early diagnosis and treatment of contagious diseases in the schools of Minnesota, but apparently too little has been said relative to the need of instituting specific protection very early in life.

### Diphtheria

As a result of immunization, Schick testing and detection of carriers by culture, the percentage of deaths in the school ages has declined materially since 1915 (Fig. 1). Little or no change in the mortality rate is evident for the infant and the pre-school child during this period of time, however. More attention must, therefore, be given to routine immunization against diphtheria during infancy and the optimum time for this procedure is at the age of six months. Toxoid is superior to toxin-antitoxin for this purpose and can be given in doses of 0.5 c.c. followed in three weeks by one c.c. About 90 per cent of cases so inoculated will show a negative Schick reaction after six months. Even better results (99 per cent negative) have been accomplished by giving a third dose (1 c.c.) one month later.[24]

Alum precipitate toxoid has been heralded[6, 7, 8, 22, 28] as being superior to all methods of diphtheria immunization since, due to its insolubility, it is more slowly absorbed and has a resultant prolonged antigenic action. It is prepared by complete precipitation with alum, which results in no loss of specific antigen, and simultaneously removes much of the undesirable protein. It is claimed that injection of five to ten units (0.5 c.c.) into children two to six years of age has resulted in 96 per cent negative Schick tests. The advantages of this preparation are stability, absence of sensitization to animal serum and the potency of the antigen. With improved methods of refining, the slight hazard of occasional abscess formation may be eliminated. Regardless of what antigen is used, however, it must be emphasized that multiple doses have been shown to produce a more sustained high level of immunity.

Schick tests should always be performed at intervals after immunization. Infection[15] and other factors may cause a diminution or even a loss of immunity.

Of greatest importance in diphtheria prevention is the early administration of toxoid. God-

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frey[5] has demonstrated that immunization of 50 to 70 per cent of school children has reduced the diphtheria morbidity in a community very little while the addition of 30 per cent of pre-school

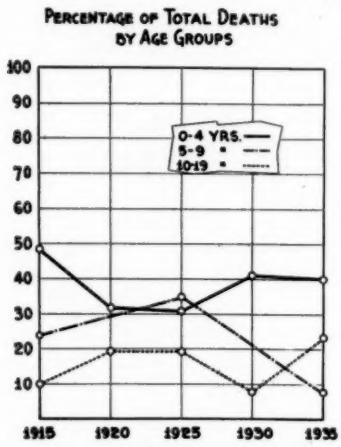


Fig. 1.

children to the program has resulted in practically eliminating the disease.

Park has said, "It is the infant who needs immunization most and is bothered by it least."

## Scarlet Fever

Inspection of Figure 2 reveals the fact that one-third of the total deaths from scarlet fever in Minnesota occur in the pre-school age group and that there has been but little relative reduction in the mortality for this class during the past eighteen years. Furthermore, the deaths in the early school period (five to nine years) constitute an additional 30 per cent of the total mortality, so that about two-thirds of the total deaths are sill occurring previous to the tenth year of life.

Doubtless much of this early mortality could be avoided by the detection of early and mild stages of the disease, as well as of the transitory carrier state of immune contacts. More widespread utilization of the blood agar culture plate for hemolysis, the Dick test, the blanching test, careful isolation and serum should be emphasized.

*Prevention by Immunization.*—During recent years the concept of a causal relationship between a certain strain of hemolytic streptococcus and scarlet fever has been gaining favor. Although considerable unanimity of opinion exists today with respect to the specific etiology of this disease, nevertheless attempts to prevent it by inoculations with a toxin derived from the scar-

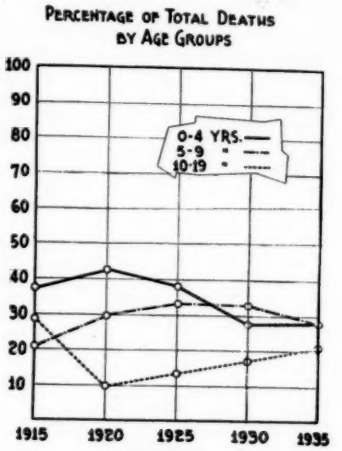


Fig. 2.

let fever strain of streptococcus is not being practised widely. The failure to do this may be justified on the basis of the poor results obtained in the past following the administration of presumably inadequate doses of scarlet fever toxin. When the methods recommended by the Scarlet Fever Committee were used, the objections by patients to five inoculations and the occurrence of occasional reactions, together with doubt in the minds of many physicians, became factors which contributed to the reluctance of many to advocate immunization to their patients.

A question which may be properly raised and must be answered before specific prevention can be urged, is whether the method of immunization recommended by the Scarlet Fever Committee really has merit sufficient to justify its adoption.

The medical literature of the past ten years furnishes us with more or less data on over 50,000 inoculated individuals. Although a great many of the reported studies are lacking in detail and in proper controls, a sufficient number are suitable for analysis, so that we may arrive at fairly safe deductions relative to the protective value of inoculations with the Dick toxin.

In the present study, a change in reaction of the Dick test has been discarded in favor of subsequent case incidence as a criterion of immunity.

Table I presents a most exacting trial of the toxin's efficacy. Here are collected the reports on persons known to be susceptible by previous test. All of these persons had a relatively high degree of exposure to infection and were observed over considerable periods of time. A compilation of these data reveals the fact that among 20,000 susceptibles inoculated in accordance with the recommendations of the Scarlet Fever Committee, only one subsequent case was reported over a period of about three years. The annual incidence of the disease was 1.65 per 100,000.

Some of the studies included in the above table did not specifically state the number of controls. For this reason the uninoculated group reported in Table II is much smaller, although the cases included are comparable, since they are from the same institutions. It is noteworthy that these were not Dick tested and, therefore, represent a less susceptible group than the one in Table I. Over two hundred cases of scarlet fever occurred among these individuals during a period of several years observation. The annual incidence per 100,000 computed from 2,282 of these which can be utilized statistically is, therefore, 2,317.

TABLE I. SUSCEPTIBLE CASES REPORTED IN LITERATURE
Patients were immunized according to the recommendations of the Scarlet Fever Committee and annual incidence of scarlet fever per 100,000 among those immunized.

| Author | Susceptibles (Dick positive) | Exposure | Time Observed | Subsequent cases |
|---|---|---|---|---|
| Dick | 11,584 | Internes & Nurses | 5 years | 0 |
| Rhoads | 298 | Nurses | 3½ years | 0 |
| Rhoads | 492 | Epidemic | 10 months | 0 |
| Knights | 26 | Nurses | 1 year | 0 |
| Kiefer | | Institutions | 3 years | 1* |
| Dudley | 17 | Epidemic | 2 months | 0 |
| Park & Schroeder | 195 | Institution | 18 months | 0 |
| Hektoen | 121 | Nurses | 4 years | 0 |
| Park | 5,000 | Institutions | 5 years | 0 |
| Platou | 149 | Nurses and Children | 3½ years | 0 |
| Peacock | 35 | Institution epidemic | 2 months | 0 |
| Blatt | 46 | Institution epidemic | 3 months | 0 |
| Broadbent | 48 | Nurses | 4 years | 0 |
| Radoye | 725 | Institution | 2 years | 0* |
| Boynton | 164 | Nurses | 3½ years | 0 |
| Veldee | | Institution | 2 years | 0 |
| Total | 20,000 | | | |

Annual case incidence per 100,000.....1.65

*Preparation and dosage not entirely up to standard of Scarlet Fever Committee.

TABLE II. UNIMMUNIZED CONTROL CASES REPORTED
The annual case incidence of scarlet fever per 100,000 population among the unimmunized.

| Author | Susceptibles and Immunes (No Dick test) | Exposure | Time Observed | Subsequent Cases | Cases per year |
|---|---|---|---|---|---|
| Dick | | Internes and Nurses | 5 years | (37) | (7.4) |
| Rhoads | 182 | Internes and Nurses | 3½ years | 15 | 4.3 |
| Rhoads | 206 | Epidemic | 10 months | 15 | 13.5 |
| Kiefer | | Institution | 3 years | (10) | (3.3) |
| Dudley | 23 | Institution Epidemic | 2 months | 2 | 12.0 |
| Hektoen | 516 | Contagious disease nurses | 10 years | 40 | 4.0 |
| Platou | 861 | Contagious disease attendants | 6 years | 55 | 9.2 |
| Boynton | 150 | Nurses | 4 years | 8 | 2.0 |
| Total | 1,938 | | | | |

Annual case incidence per 100,000.....2,317

The most convincing evidence regarding the merit of adequate immunization is found in a study of nurses from the Central School of Nursing at the University of Minnesota. During the past five years, two hundred and sixty-four susceptible nurses have been inoculated according to the recommendation of the Scarlet Fever Committee. Only one of these* has had scarlet fever during this period whereas twelve out of two hundred and fifty non-tested affiliate nurses have contracted the disease in the same period of time. Since both groups did similar work in their apprenticeship on the scarlet fever wards, they are particularly comparable.

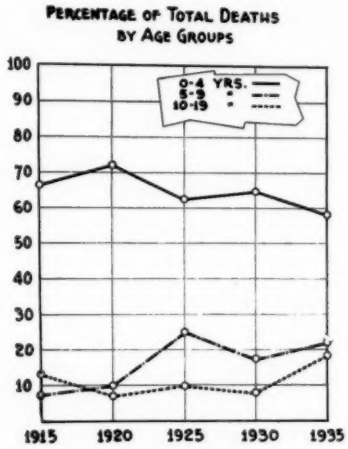

Fig. 3.

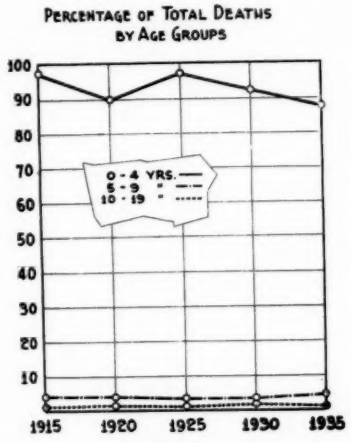

Fig. 4.

It would seem from the evidence available to date, that graduated doses of pure scarlet fever toxin administered to the point of a negative Dick test, has definite merit, and the procedure is warranted in spite of certain objections which operate to prevent its widespread use. The practice of immunization against scarlet fever for the prevention of institutional and community epidemics seems particularly desirable.[16]

*Treatment.*—Septic cases of scarlet fever with exudative manifestations in the nose and throat are most effectively treated by intravenous administration of large doses of convalescent human serum or by repeated immuno-transfusions. Toxic cases that can be treated early in their course are greatly benefited by large doses (12 to 18,000 units) of scarlet fever antitoxin. Sulfanilamide or neoprontosil in continued doses of .03 gm. per pound per twenty-four hours have recently been shown to effectively complement the specific serum and markedly reduce complications.[20] It is believed that this drug acts synergistically with the actively produced or passively conferred specific defenses of the body.

*The nurse who contracted scarlet fever was immunized to the point of a negative Dick test eighteen months prior to infection. A Dick test performed six months before her attack of mild scarlet fever was positive, but she was not re-immunized.

Immediate prophylaxis is best accomplished by giving 20 c.c. of convalescent human serum subcutaneously, combined with sulphanilamid by mouth.

## Measles

Attempts at active immunization against measles by Herman, Degkewitz and other workers have failed. Convalescent serum, first used by Weisbecker[27] in 1896, revived by Cenci,[2] Zingher[29] and many others, has probably been neglected too much. Elterich[4] pointed out that measles is a serious disease in the young, causing 8,000 to 10,000 deaths annually in the United States, most of which occur below the age of three years. Kaiser[9] contends that measles is responsible for 6 per cent of all child deaths, and states that the mortality is 55 per cent under two years of age. Lord[11] stresses the advantage of using whole citrated blood from adults in the family and believes in giving it after the appearance of the rash, to insure permanent immunity. Dulitskiy[3] and de Sousa[23] used adult blood and placental blood in doses of 20 c.c., and report attenuating the disease and reducing the mortality in similar groups of infants from 39.6 per cent to 4.6 per cent. They believe the serum loses its potency in thirty days. McKhann[12] pre-

pared extracts of human placentas by precipitation with ammonium sulphate. Suspensions of this extract in saline, when injected into children exposed to measles, had a protective effect similar to that of convalescent serum.

In our experience,[18] convalescent serum, 6 to 10 c.c., or blood, 12 to 20 c.c., given intramuscularly between the fifth and ninth day of incubation have resulted in the greatest degree of attenuation and the least reaction. The production of prolonged immunity is not interfered with by this method.

Though most of us are prone to entertain the thought that measles is "just measles," inspection of mortality Figure 3 should convince us that such a concept is wrong; that not only should convalescent serum or blood be used as a preventive in debilitated children but as an attenuating agent in every small child exposed to measles. In pre-eruptive measles, large doses of convalescent serum (or immune blood) have recently been shown to modify the disease in a rather striking manner. The effects of sulfanilamide on streptococcal complications is now being studied.

### Pertussis

Of the diseases under discussion, pertussis takes the highest toll in infancy and yet our methods for its control are the least effective (Fig. 4). Early diagnosis by means of blood studies (leukocytosis and relative lymphocytosis) the cough plate culture (with chocolate agar) and the isolation of the infected school child, may help to protect infants from exposure and defer the onset of the disease to a later period in life. However, in the average home, contacts are so intimate that these measures are inadequate. The eventual solution of the problem must be through immunization. Much progress has recently been reported in this field. Madsen[13] of Denmark probably revived the hope of an effective vaccine for prevention with his studies in Iceland. Sauer[21] reported a study of 396 children who were observed for five years following injection of 80 to 100 billion organisms in a vaccine prepared from fresh hemolytic strains of B. pertussis grown for forty-eight hours on Bordet-Gengou media to which human blood had been added. He contends that immunity results after a four-month period.

Kruger and Frawley[10] have reported studies with a vaccine prepared by destroying bacilli without resorting to heat and using very large dosage. Bailey[1] has produced a serum of high titre from birds which seem relatively immune to the B. pertussis. The studies of Rich[19] throwing some doubt on the Bordet-Gengou bacillus as the specific etiologic agent in pertussis may be somewhat disturbing to enthusiasts who favor vaccines made from this organism. From available data, however, it seems that freshly prepared Phase I type of vaccine offers some promise of sustained partial immunity especially if repeated (annual) antigenic stimuli are utilized.

A marked attenuating effect from large doses of convalescent serum given after exposure or early in the disease has been observed in a group of children studied by Bradford.

### Erysipelas

Erysipelas is an extremely serious disease in infancy. The newer treatments are antitoxin, human convalescent serum, roentgen irradiation, ultraviolet irradiation and sulfanilamide.

Symmers and Lewis[25] have reported at length on the use of antitoxin. It is prepared by immunizing horses with eight strains of streptococcus, and is preferably given by intramuscular injection. They believe it helps to control the immediate attack and reduces mortality.

Concentrated roentgen ray therapy in erysipelas was first introduced in 1926.[17] The distance used was 10 inches, with 2 mm. aluminum filter, 111 kilovolts, 5 milliamperes, 5 minutes. It was found to be effective in limiting the spread of the disease and comparative studies indicate that it reduces mortality.

Although roentgen irradiation is effective, it has drawbacks such as inherent dangers, expense, lack of proper facilities, and that it must be given by a trained radiologist. Short wave ultraviolet therapy[26] causes a somewhat similar reaction in the skin. It is inexpensive, applicable, usually requires only one treatment although it may be repeated, and is without danger. It must be given at a distance of eight inches with an exposure of eight to fifteen minutes, one inch of the contiguous normal skin being included in the treatment area. The combined use of roentgen or ultraviolet irradiation convalescent serum and sulfanilamide definitely reduces the mortality of erysipelas. Transfusion is a helpful adjunct.

### Epidemic Meningitis

When this disease is considered in the light of its pathogenesis, the rationale of certain therapeutic innovations may be more acceptable.

Meningococci invade the blood stream from minute foci in the upper respiratory tract. Subsequent loss of integrity to peripheral vessel walls occurs due to action of the toxin. This results in perivascular inflammation and hemorrhage, and organisms along with erythrocytes and leukocytes thus gain access to the skin or arachnoid or both. Meningitis per se is usually a late development.

Massive doses of highly antitoxic serum given intravenously to quickly neutralize the toxin have reduced the case fatality rate in the Chicago area from about 50 per cent to 15 per cent. Sulfanilamide alone has effected a high percentage of cures. The latter is now believed to be highly synergistic to serum (or other natural defenses in the body). Oral therapy with the drug is adequate due to its rapid absorption into all tissue fluids and the combined treatment is so satisfactory that intrathecal administration of either agent is now rarely resorted to. Fever therapy has proved effective in chronic meningitis.

### Smallpox

In recent years, aside from the well-known glycerinated-vaccinia-vaccine, several newer antigens have been recommended: the chorio-allantoic chick embryo vaccine prepared according to the method of Goodpasture and the lyophile tissue vaccine of Rivers. The latter is administered intracutaneously and is particularly useful when children with skin diseases require vaccination, and when the vaccine has to be shipped under climatic conditions which may readily destroy the potency of the vaccine.

### Rabies*

During the past fifty years, the original Pasteurian procedure has been modified primarily to increase the immunity and secondarily to reduce the complications in form of paralysis or even infection (Högye's method). The fixed virus is subjected either to heat or to the action of chemicals such as carbolic acid or ether. The so-called Semple or phenol treated vaccine is now quite generally used, and although the statistics regularly presented by McKendrick (Bull. Health Organization, 6:17, 1937) would indicate that the killed vaccines give rise to a substantial degree of immunity when given in adequate dosage, there is definite evidence that some preparations on the market are inactive and that, as a whole, they are inferior to vaccines in which the virus is alive but attenuated. On a comparative basis, the etherized vaccines prepared according to Alivisato's method are generally considered superior to the Semple vaccine.[29] Since the immunity mechanism in rabies is by no means understood, it is indeed difficult to evaluate the protection which may be conferred by certain preparations. It is not unlikely that the resistance of the ganglion cells to the virus is independent of the antibodies found in the circulation. For example, a veterinarian, who had been bitten on the thumb by a rabid dog, was thoroughly treated with Semple vaccine, developed neutralizing antibodies in his serum and yet succumbed to rabies.

While there are several objections to the use of live vaccines in the prophylaxis of most diseases, the fact that the case mortality rate in rabies is so high and the patient is already infected at the time of vaccination one seems warranted in taking greater risks when there is known infection. The so-called mixed treatment consisting of etherized vaccine followed by Högye's dilution method or vice versa seems to be justifiable in deep bites with localization on the head. Those who are frequently brought in contact with the problem of anti-rabic treatment may profitably consult a recent monograph by Mario J. Van Stockum (New Principles of Antirabic Treatment, Hague, 1935).

### Tetanus*

Tetanus antitoxin acts not by interfering with the germination of the spores but by neutralizing the toxin as fast as it is formed. It should be used prophylactically in cases in which there is danger of contamination of a wound with manure, soil, stable dust, et cetera. The initial dose of 1,500 units (800 to 1,000 units) should be repeated on the fifth day after the initial dose. In fact, third and even fourth injections may be indicated when the wound is very bad. Since the protection wears off in the course of two or three weeks, sensitization with horse serum is undesirable and sometimes severe

*Quoted verbatum from K. F. Meyer.

serum reactions accompany the treatment, there is a tendency to reinforce the passive immunity by means of active immunization. The latter procedure is equally advisable in children, who are constantly subject to injuries which may be followed by tetanus. The French Army has pioneered in this field of active immunization. Postinfectional preventive serum therapy is now enhanced by the injection of 1 c.c. of tetanus toxoid about fifteen minutes after the administration of the serum followed by two injections of 2 c.c. of toxoid at two weekly intervals. Such a treatment raises the antitoxin level of the patient's serum over one quarter unit per cubic centimeter, and although at least 1/200th unit may be demonstrable nine years after the injection of the toxoid, it is advisable to repeat the treatment every time a new injury is acquired. One injection of toxoid seems to push the titer over the minimal requirements. Ramon recommends highly the systematic active immunization of children against tetanus by using the combined diphtheria-tetanus toxoid mixture. Three injections at three week intervals in dosages of 2 c.c. are used in France. The usual contraindications, malnutrition and skin diseases equally apply to this procedure. As a rule, the local and general reactions are observed in about 20 per cent of the vaccinated regardless of the dose. Tetanus-toxoid alum precipitated has been used by McBryde and by Holdman in this country. Two injections of 1 c.c. each at an interval of two months followed by a third injection at the time of injury permit the practitioner to immunize the allergic child effectively and securely against tetanus.

Whether or not antitoxin is of any value in man when given subsequent to the development of tetanus is a question that has received no definite answer. The evidence merely goes to show that in therapeutic treatment of tetanus, large and repeated doses of serum reduce the mortality. In practice, it seems advisable to administer the serum by the intravenous and intramuscular route. Patterson, who treated twenty-six consecutive children suffering from tetanus with only seven deaths (26 per cent mortality), used the intravenous and intramuscular route and enormous doses of serum (120,000 to 1,970,000 units). His critics claim that he could have reduced the mortality even further had he adopted the intrathecal administration of one dose of serum (20-30 c.c.) by the cisterna magna route as practiced by Yodh in India. The lumbar puncture route is quite generally considered less effective and even harmful.

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# ESSENTIALS IN THE DIAGNOSIS OF CONGENITAL HEART DISEASE*

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AN UNDERSTANDING of the ontogenesis of the different congenital defects provides not only a list of the morphologic variations which congenital cardiac anomalies may assume, but also permits a clear understanding of the manner in which each anomaly modifies or burdens the physiologic mechanism of the cardiovascular apparatus. These constitute fundamental requisites for the clinical recognition of congenital heart disease in its various forms.

## The Genesis of Cardiovascular Anomalies

If one begins with the premise that the cardiovascular system recapitulates its ancestral history during the course of its own development, it is reasonable to expect that, if arrest of development does occur, it will represent the adult form of one of the lower vertebrate series, dependent on the stage at which arrest takes place. The intermediate stages are, in fact, particularly well illustrated in the developing mammalian heart because it assumes functional activity at a very early stage of gestation. As in its phylogenetic history, it starts as a simple tube-like structure with the same subdivisions as the adult fish heart (Fig. 1*a*). Expressed in the simplest form its development from then on consists essentially in: (1) septal formations dividing the auricle, the ventricle, the bulbus cordis, and the common aorta or truncus arteriosus each into two sections (Fig. 1*b*); (2) torsion of the cardiac tube; (3) development of the bulbus cordis; (4) the incorporation of the sinus venosus into the right auricle (Fig. 1*b*); (5) the evolution of the aortic arches, some being obliterated, others becoming the permanent aortic arch, pulmonary artery and their branches; and (6) closure of fetal channels after birth.

*Septal formations.*—This process is the physiologic response on the part of the cardiac tube to the evolution of a lung-respiratory system so that the venous and arterial systems eventually become completely separated from one another. Any of these septal formations may be incomplete, resulting in any one of a variety of well-known defects (Table I). The cor biloculare in which no septa have developed is the replica of the fish heart. The amphibian form is represented by the cor triloculare biatriatum in which the interventricular septum is absent. Small interventricular septal defects, such as the maladie de Roger, resemble the adult form of the heart of some of the higher reptiles.

Now if it is realized that the different developmental processes which are being described are occurring more or less synchronously, it is apparent that multiple sites are liable to be involved, though isolated anomalies, of course, frequently occur. Normally, septal formations are complete after the seventh week of fetal life.

*Torsion of the cardiac tube.*—At an early stage the cardiac tube becomes kinked on itself by virtue of the fact that its extremities are relatively fixed as the primitive heart elongates (Fig. 1*b*). The torsion to which I refer, however, applies to a clockwise rotation of the bulboventricular end of the cardiac tube during which the aorta moves toward the left and partially behind the commencement of the pulmonary artery. If one will examine the anterior aspect of the adult normal heart this relationship will become clear. This torsion is necessary in order to bring the left ventricle into juxtaposition with that part of the truncus arteriosus which is destined to become the aorta, and the right ventricle into juxtaposition with the pulmonary artery. As in the adult heart of certain reptiles, there is a transitory stage in the human heart in which there are two aortæ connected with the left ventricle, each with two cusps. In the process of torsion, the right aorta is obliterated whereas the left remains open to become the outflow chamber of the left ventricle. If this process of torsion is arrested, the aorta is left in a dextroposed position, in which case the right aorta persists instead of the left, or the right and left aortæ may fuse to form a large aortic trunk. In either case this dextroposed aorta, instead of bearing the normal relationship to the left ventricle, overrides the interventricular septum (which

*From the Section on Cardiology, The Mayo Clinic, Rochester, Minnesota. Read before the meeting of the Minnesota State Medical Association, Duluth, Minnesota, June 29 to July 1, 1938.

is usually incomplete) and the right ventricle (Fig. 2). In other words the great vessels (the aorta and pulmonary artery) are transposed, and this transposition may be present in varying degrees depending on the degree of torsion that has occurred. Sometimes there is a small niche in the right ventricle which represents the obliterated right aorta. It is extremely likely that other developmental defects will accompany such a gross deviation from the normal, such as imperfect septal formations and incomplete evolution of the bulbous cordis.

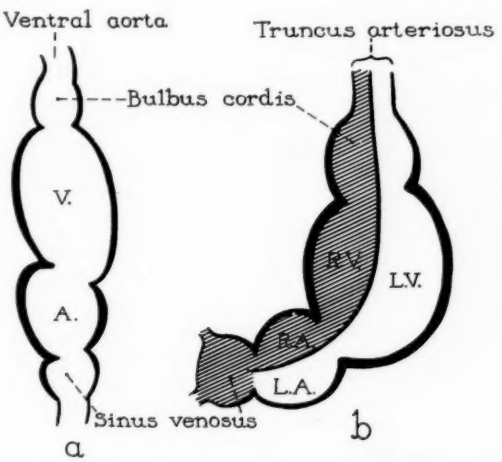


Fig. 1*a*. Fish type of heart, which is similar to the heart in the fourth-week human embryo; *b*, septal formation. The sinus venosus is incorporated in the right auricle, the bulbus cordis becomes part of the right ventricle (mainly) and of the left ventricle, and a clockwise rotation occurs in the bulboventricular part of the cardiac tube.

Here, then, one sees the genesis of one of the important and interesting anomalies representing arrest at the reptilian stage, namely, the tetralogy of Fallot. This consists of dextroposition of the aorta, with an interventricular septal defect, pulmonary stenosis and an hypertrophied right ventricle. Cusp anomalies are frequently associated with the tetralogy, especially in the form of bicuspid leaflets which are, interestingly enough, the normal for the reptilian species.

*The development of the bulbus cordis.*—Essentially this consists of the incorporation of the major portion of the bulbus into the right ventricle, to form the conus arteriosus, and a smaller portion into the left ventricle. If this process is incomplete, the corresponding ventricle will be constricted or stenosed in that region. Thus in the case of the left ventricle there will be a stenotic band below the aortic valve, that is, a subaortic stenosis. Its counterpart in the right ventricle consists of a subpulmonic or infundibular stenosis.

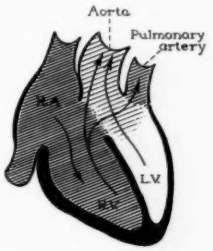


Fig. 2. The tetralogy of Fallot, showing a large aorta which is dextroposed and overrides the interventricular septum. The latter is incomplete. The pulmonary artery is stenosed and the right ventricle is hypertrophied. The left auricle is not indicated in this diagram.

In the genesis of some of the stenotic congenital lesions, fetal inflammatory processes probably play a part.

*The incorporation of the sinus venosus into the right auricle.*—In the adult heart the sinus venosus is represented by that part of the right auricle which receives the blood from the superior and inferior venæ cavæ anatomically known as the sinus venarum.

*The development of the aortic arches.*—Briefly stated, there are six pairs of aortic arches connecting the primitive ascending aorta to the primitive descending aorta. They are not all present at the same time. The left fourth arch becomes the aortic arch. The right fourth arch forms the innominate artery and the beginning of the right subclavian artery. The sixth arch gives origin to the pulmonary artery, and on the left side, to the ductus botalli.

The chief anomalous developments met are persistence of both fourth arches and persistence of the right arch in place of the left. The latter arrangement is closely related to coarctation of the aorta. The very plausible explanation has been given that if for any reason the left fourth arch becomes stenosed, then one of two terminations results, namely, coarctation, or the right fourth arch may remain patent, forming the aortic arch.[3] In the latter instance the patency of the right arch is salutary; it usually runs over the right bronchus and behind the trachea and esophagus to join the descending aorta. The left arch is here represented by the left subcla-

vian artery, the stenosed fourth arch and a diverticulum which would have formed that part of the aortic arch between the point where the ductus botalli joins it and the descending aorta

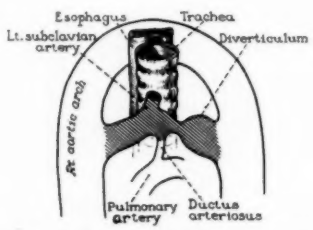


**Fig. 3. Persistent right aortic arch, representing the right fourth aortic arch. Note its relation to the trachea and esophagus. The shaded part represents the left fourth arch which normally becomes the aortic arch.**

if the left arch had been normally patent (Fig. 3). Coarctation of the aorta is frequently associated with aneurysms of the circle of Willis.[4,15] Permanent patency of the ductus arteriosus (botalli) should be considered together with anomalies of the aortic arches, as the former is derived embryologically from the latter. The opening up of the pulmonary circulation after birth usually leads to gradual closure of the ductus. Should conditions remain such that pressure in the pulmonic circuit and the aortic arch remains the same as before birth, the duct will remain patent. Patency of the ductus is frequently associated with other anomalies of the aortic arches.

*Closure of fetal channels.*—This refers to the closure of the ductus arteriosus and the foramen ovale.

*Classification.*—Associated with each of these processes, anomalous developments may occur and congenital cardiac lesions conveniently classify themselves under the corresponding subdivisions shown in Table I.

Such a classification is self explantory and easily remembered. Viewed in this light, the corresponding physiologic disturbance caused by each anomalous condition is readily understood and the symptoms and physical findings are more readily explained. By the same token it becomes apparent when cyanosis will supervene and when it will not. There is, therefore, no particular advantage in dividing them further into clinical groups.

TABLE I. CLASSIFICATION OF CONGENITAL HEART DISEASE

I. Anomalies associated with septal formation:
   1. Cor biloculare
   2. Cor triloculare biatriatum
   3. Cor triloculare biventriculare
   4. Auricular septal defects
   5. Ventricular septal defects
   6. Persistent truncus arteriosus

II. Anomalies associated with torsion of the cardiac tube and

III. Anomalies associated with development of the bulbus cordis:
   1. Subaortic stenosis
   2. Pulmonary stenosis
   3. Transposition of great vessels
   4. Tetralogy of Fallot
   5. Eisenmenger's complex
   6. Anomalies of the aortic and pulmonic valve cusps

IV. Anomalies associated with development of the aortic arches:
   1. Persistent right aortic arch with isthmus stenosis of the left arch
   2. Double aortic arches
   3. Coarctation of the aorta
   4. Anomalous origin of vessels arising from the aortic arch
   5. Patent ductus botalli

V. Dextrocardia

VI. Anomalies of the coronary vessels

## Certain Facts and Findings Which Should Lead One to Suspect the Presence of a Congenital Cardiac Anomaly

*Bruits not explainable on the basis of the conventional acquired valvular lesions.*—Certain murmurs are described as being diagnostic of particular congenital anomalies. Thus, the so-called Roger murmur of a patent interventricular septal defect was originally described as a murmur which begins with systole and is prolonged to such an extent "that it entirely covers the natural tic-tac of the normal heart sounds"; the continuous or "machinery" murmur in the second left interspace is very characteristic of patency of the ductus arteriosus. What has not been sufficiently stressed is that the distribution of the murmur may be as important as the character of the murmur. Thus, in certain cases, a patent ductus botalli is associated with a soft systolic murmur heard to the left of the sternum, but one's suspicions should be aroused when such a murmur in this area is equally well heard near the left shoulder. No warning too strong can be voiced against making any diag-

nosis on the presence of systolic basal murmurs alone, since these murmurs occur in the absence of any organic cardiovascular disturbance, particularly under conditions, such as mere excitement or hyperthyroidism, which speed up the circulation. In many cases systolic basal bruits have been shown to be the result of minor degrees of calcareous aortic disease.[7] In any case of organic heart disease in which a systolic murmur is present the murmur will invariably be associated with other physiologic disturbances of the cardiac mechanism, which in themselves will supply the collateral evidence which must be present before a positive diagnosis is justifiable. This applies to any type of organic heart disease.

*Thrills.*—These are frequently present over the areas of maximal intensity of the bruits, and both thrills and bruits become more readily elicited clinically after exercise.

*Evidence of venous-arterial shunt, with the usual manifestations: cyanosis, polycythemia, and clubbed fingers and toes.*—In the group of cases in which the venous-arterial shunt is transitory, depending on temporarily induced increased pressure on the venous side, there frequently is a history of episodes of dyspnea or cyanosis. A rather unique feature relative to the cyanosis of congenital heart disease is the absence of edema when the cyanosis is quite pronounced.

*Any unusual heart contour in the roentgenogram, such as a prominent pulmonary artery.*—Points readily overlooked are: lack of prominence of the aortic knob; shadows to the right of the sternum running up toward the right sternoclavicular joint, as is seen in persistent right aortic arch, and erosion of ribs, which may in itself be diagnostic of coarctation of the aorta. These features are often better elicited by fluoroscopy.

*Hypertension.*—In a young individual hypertension should lead one to examine the strength of the pulsation in the abdominal aorta and femoral arteries and to look for other evidence to exclude or confirm the presence of coarctation of the aorta.

A cerebrovascular accident in a young person should raise the question of a ruptured aneurysm of the circle of Willis in association with coarctation of the aorta.

*Congenital anomalies.*—Congenital anomalies in any part of the body should lead one to examine carefully for cardiac anomalies. In Abbott's series,[1] 18.8 per cent of patients had anomalies elsewhere. Mongolian idiots, too, are prone to have congenital cardiac lesions.

*Subacute bacterial endocarditis.*—This frequently occurs as a complication of congenital heart disease.

*Comment.*—When the presence of a congenital cardiac anomaly is suspected, a search should be made for collateral evidence. The murmurs of congenital heart disease are frequently known to have been present since birth. A careful physical examination, a study of the contours of the heart, if necessary, by roentgenoscopy, and a study of the electrocardiographic pattern will contribute the necessary evidence for making a differential diagnosis. Once an anatomic diagnosis has been arrived at, the resultant physiologic mechanism should be reasoned out and checked against the physical findings. For instance, should a loud systolic murmur, best heard over the pulmonic area, lead to the conclusion that a patent ductus arteriosus is present, this opinion should most definitely be revised if the electrocardiogram shows left axis deviation, since this is exactly the opposite of what is consistent with such a diagnosis.

Finally, statistical evidence with reference to the frequency of different congenital lesions will serve to avoid diagnostic errors. Thus, a diagnosis of pulmonic stenosis is made far more frequently than its actual incidence, especially as an isolated lesion.

## The Electrocardiogram in Congenital Heart Disease

If one can divorce from one's mind the idea that congenital heart disease is an entity separate from heart disease in general and adheres to the physical principles governing electrocardiography, the subject becomes much more clearly understood. With the single exception of dextrocardia with complete situs transversus, there are no diagnostic electrocardiographic patterns in congenital anomalies. The information so obtained serves merely as one link in the chain of evidence.

Again I must refer to the physiologic alterations concerned in any particular anomaly. If

the condition is such as to throw added strain on the left ventricle, as in coarctation of the aorta or subaortic stenosis, a left axis deviation in the electrocardiogram will reflect such a condition as eloquently as it does in arterial hypertension or in acquired aortic disease. If myocardial changes result as a consequence, T-wave changes in leads I and II can be expected to follow.[5] It so happens that the majority of congenital defects are attended sooner or later by strain on the right side of the heart, either because of arteriovenous shunts or stenotic pulmonary effects. Corresponding roughly to the degree, there will be right axis deviation and perhaps T-wave alterations in leads II and III.[5] P waves may be exaggerated, as in acquired mitral stenosis, indicating greater auricular activity.

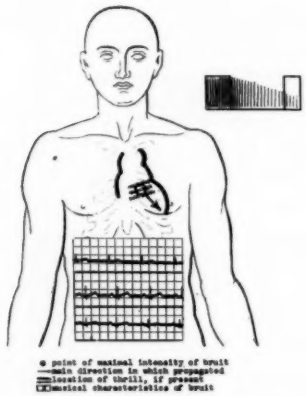
point of maximal intensity of bruit
main direction in which propagated
location of thrill, if present
musical characteristics of bruit

Fig. 4. Interventricular septal defect. The heart contour is normal and the electrocardiogram is normal.

Conduction interferences are at times of considerable diagnostic help when caused by interventricular septal defects, while coronary types of T-wave changes have been noted when the coronary vessels originated from the pulmonary artery.[12]

Auricular fibrillation is very unusual except in a widely patent foramen ovale accompanied by distention of the right auricle.

Very meager information is forthcoming from the literature regarding the fourth lead in cases of congenital heart disease. Of the cases in which a diagnosis of congenital heart disease was made, a fourth lead (Wolferth) was recorded in seventeen. The frequency of abnormal changes is indicated in Table II. It is apparent again that such changes are not in any sense diagnostic but seem to be associated with a cardiac mechanism which throws an added strain on the right side of the heart, particularly if the strain is pronounced or of long standing.

A group of twenty-six cases reported by Edeiken, Wolferth and Wood,[8] in which the fourth lead showed the only electrocardiographic abnormality, included one congenital anomaly. The fourth lead was upright in this case and it was associated with right ventricular preponderance "to the extent of +128°."

### The Diagnostic Features of Individual Congenital Anomalies

*Interventricular septal defect (maladie de Roger).*—Mechanism. There is an arteriovenous shunt because of the higher pressure in the left ventricle. With a failing left ventricle, or with increased pressure on the right side of the heart, the flow is reversed and under these conditions only does cyanosis occur.

The syndrome (Fig. 4). The bruit and the thrill are the important findings. Roger's original description[9] of the bruit has already been commented on. It is best heard in the third and fourth left interspaces and is conducted toward the apex. The second pulmonic sound is not accentuated. The heart's shape has been described as being globular but in the majority of cases it is normal, as is the electrocardiogram. Occasionally, however, there is evidence of interference with the conductive system. Symptoms are absent, but subacute bacterial endocarditis is a frequent complication.

*Interauricular septal defect (widely patent foramen ovale).*—Mechanism. The shunt again is arteriovenous until conditions arise which cause a reversal of pressures. Cyanosis is thus a frequent terminal event.

The syndrome. Until such events as just described occur, there are generally no signs or symptoms, no cardiac enlargement or abnormal contour features, and the condition may thus remain unsuspected and undiagnosed. A patent foramen ovale should be suspected when (1) there is a history of cyanotic spells or undue cyanosis during pulmonary infections, and (2) when systolic or presystolic bruits, with or without thrills, are audible over the upper portion of the sternum and are not otherwise explainable.

TABLE II. A RECORD OF FOURTH LEADS IN CASES OF CONGENITAL HEART DISEASE

| Case | Age, years | Clinical diagnosis | Axis deviation | Fourth lead (Wolferth) | Cardiac symptoms | Comment |
|---|---|---|---|---|---|---|
| 1 | 22? | Auricular septal defect and mitral stenosis | Marked R.V.P.* | Upright T wave Absent R wave | Early decompensation with cyanosis and clubbing | Exaggerated $P_2$ and $P_3$ waves |
| 2 | 45 | Patent ductus arteriosus and patent interventricular septum | R.V.P. (despite the presence of a superimposed hypertension) | Diphasic T wave Absent Q wave | Decompensation | Exaggerated $P_2$ and $P_3$; diphasic $T_2$ and $T_3$; delayed A-V conduction |
| 3 | 22 | Auricular septal defect and patent ductus arteriosus | Marked R.V.P. | Upright T wave | Early decompensation | Exaggerated $P_2$ and $P_3$ |
| 4 | 41 | Patent ductus arteriosus with mitral and aortic endocarditis | R.V.P. | Upright T wave with elevated R-T segment | Early decompensation | Auricular fibrillation |
| 5 | 27 | Patent ductus arteriosus | R.V.P. | Diphasic T wave | Absent | |
| 6 | 37 | Patent ductus arteriosus | R.V.P. | Normal | Absent | |
| 7 | 16 | Ventricular septal defect | No preponderance | Normal | Absent | |
| 8 | 61 | Patent ductus arteriosus | R.V.P. | Normal | Absent | |
| 9 | 45? | Ventricular septal defect | No preponderance | Normal | Absent | |
| 10 | 23 | Patent ductus arteriosus | No preponderance | Normal | Absent | |
| 11 | 25 | Ventricular septal defect | No preponderance | Normal | Absent | |
| 12 | 52 | Auricular septal defect with mitral stenosis | R.V.P. | Isoelectric T wave | Decompensation | Auricular fibrillation |
| 13 | 24 | Patent ductus arteriosus | R.V.P. | Normal | Absent | |
| 14 | 20 | Ventricular septal defect with patent ductus arteriosus | R.V.P. | Huge inverted T wave | Poor cardiac reserve | Inverted $T_2$ and $T_3$; incomplete bundle branch block; auricular fibrillation |
| 15 | 19 | Patent ductus arteriosus with ventricular septal defect | R.V.P. | Slight depression of R-T segment | Dyspnea on exertion | |
| 16 | 27 | Patent ductus arteriosus | No preponderance | Normal | Absent | |
| 17 | 19 | Ventricular septal defect | Marked R.V.P. | Deeply inverted T wave "M" notching of QRS with diminished Q and exaggerated S wave. | Dyspnea on exertion Cyanosis and clubbing present | Exaggerated $P_2$. Incomplete bundle branch block. Inverted $T_2$ and $T_3$. |

*Right ventricular preponderance.

When symptoms do occur, there is usually evidence of right ventricular hypertrophy with enlargement of the pulmonary artery and also of the right auricle. The roentgenologic and electrocardiographic findings will then be in keeping with such events.

*Comment.*—Among congenital heart lesions, a widely patent foramen ovale is the only one which at times terminates in auricular fibrillation. Paradoxical embolism may occur, but subacute bacterial endocarditis is a rare complication.

*Lutembacher's disease (mitral stenosis and interauricular septal defect).*—Mechanism. Something of a vicious circle is created by the fact that an easier egress exists through the interauricular septal defect for the blood in the left auricle than through the stenosed mitral orifice (Fig. 5). This means that blood already aërated reaches the right side of the heart, to be sent to the lungs again. While this is no special disadvantage at first, the right ventricle soon hypertrophies, and when it fails, as it inevitably does, a reversal of blood eventually results from the right side of the heart to the left, and cyanosis develops. As decompensation is controlled the degree of cyanosis decreases.

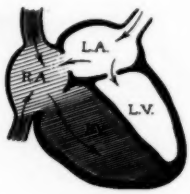


Fig. 5. Lutembacher's disease (patulous foramen ovale with mitral stenosis).

The syndrome. The syndrome consists of: (1) the auscultatory findings of mitral stenosis at the apex, (2) at times, a high pitched bruit audible over the upper portion of the sternum accompanied by a thrill (in a recent case the correct diagnosis was arrived at by this finding), (3) roentgenologic evidence of cardiac hypertrophy; especially affecting the right ventricle, a prominent pulmonary conus and an enlarged right auricle; the aortic knob is smaller than normal, and the pulmonary vessels may be so increased in prominence as to simulate pathologic mediastinal lymph nodes (Fig. 6) (in the case just referred to the preliminary diagnosis was mitral stenosis and Hodgkin's disease), and (4) marked right axis deviation in the electrocardiogram.

*Comment.*—Right heart failure eventually results.

*Subaortic stenosis.*—Mechanism. The mechanism is the same as in acquired aortic stenosis.

The syndrome. The syndrome consists of: (1) a harsh systolic bruit at the base transmitted to the vessels in the neck, (2) an accompanying thrill, (3) forceful action of the left ventricle in contrast to a weak radial pulse, (4) absence of symptoms, and (5) evidence of left ventricular strain roentgenologically as well as electrocardiographically (Fig. 7).

Fig. 6. Roentgenologic appearance of Lutembacher's disease, showing the enormous dilatation of the pulmonary vessels (simulating a mediastinal tumor) and the rounded apex, representing a much hypertrophied right ventricle.

*Comment.*—The prognosis is good.

*Pulmonary stenosis.*—Mechanism. (1) With a closed interventricular septum, the right ventricle naturally hypertrophies markedly. Depending on the degree of the defect, cyanosis almost inevitably supervenes, although the individual may reach adult life before it becomes noticeable. Once it begins, it is likely to be progressive, with increasing clubbing and polycythemia. (2) With an interventricular septal defect (which is far more common), the load is taken off the right ventricle to some extent, but cyanosis occurs earlier because of the venous-arterial shunt. In both instances the foramen ovale is likely to be patent, no doubt, because of increased pressure on the right side of the heart; this may add to the venous-arterial shunt.

The syndrome. The syndrome consists of: (1) A harsh systolic bruit in the second left interspace, which is transmitted toward the left shoulder and not to the vessels in the neck, (2) a well-marked thrill, (3) a prominent conus, and enlargement of the right auricle, (4) right ventricular strain electrocardiographically, and

there may be T-wave changes in leads II and III significant of right heart strain, and (5) cyanosis, sooner or later, with the usual secondary manifestations (Fig. 8).

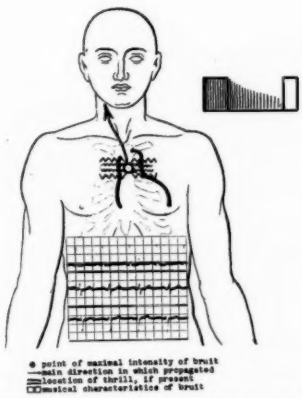
● point of maximal intensity of bruit
—main direction in which propagated
location of thrill, if present
musical characteristics of bruit

Fig. 7. Subaortic stenosis. The left ventricle is hypertrophied and the electrocardiogram shows left axis deviation.

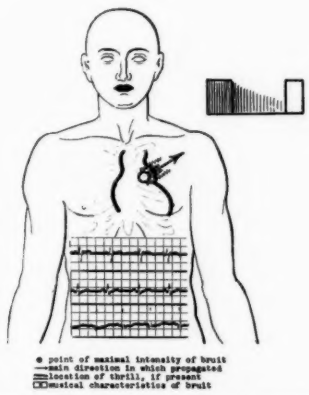
● point of maximal intensity of bruit
—main direction in which propagated
location of thrill, if present
musical characteristics of bruit

Fig. 8. Pulmonary stenosis, showing the prominence of the conus shadow and the hypertrophied right ventricle. The electrocardiogram shows right axis deviation. The shading of the lips indicates cyanosis.

*Comment.*—Symptoms tend to develop early. Dyspnea on exertion heralds the manifestations associated with impaired oxygenation and myocardial damage. Not a few patients succumb to subacute bacterial endocarditis.

*The tetralogy of Fallot.*—Mechanism. As the right ventricle empties itself, the smaller portion of venous blood enters the much narrowed pulmonary artery, whereas the major portion enters the large aorta, which usually directly overrides the defect in the interventricular septum (Fig. 2). The venous blood which does get aërated returns to the left auricle and so to the left ventricle. With contraction of the latter, this aërated blood joins the stream of venous blood from the right ventricle in the aorta. It is apparent, then, that with the combined effects of the venous-arterial shunt and the much restricted pulmonary circulation, cyanosis will be prominent. The peribronchial vessels help, to a greater or lesser degree, to carry blood for aëration to the lungs, and the efficiency of this alternate route does a good deal toward establishing the prognosis in the individual case.

The syndrome. The syndrome is as follows: (1) Cyanosis tends to begin early in life and often becomes extreme, (2) bruits may be absent, but there is usually a systolic murmur at the base transmitted to the vessels in the neck, with or without an accompanying thrill, (3) the heart becomes sabot-shaped because of the prominent right ventricle without enlargement of the pulmonary artery, and because of the dextroposition of the aorta, the great vessels will be prominent on the right, and (4) there is electrocardiographic evidence of right ventricular strain (Fig. 9).

*Patent ductus arteriosus.*—Mechanism. Because of the higher aortic pressure, blood is shunted from the aorta into the pulmonary artery. While this is not particularly disadvantageous, it does increase the load on the right ventricle. When conditions arise which increase the pressure in the pulmonary circuit above that in the systemic circulation, a reversal of the shunt occurs, with cyanosis corresponding in degree and duration to the extent of the shunt.

The syndrome. The syndrome consists of: (1) A "machinery" or continuous murmur in the second left interspace which is transmitted toward the left shoulder, the second pulmonic sound usually being accentuated, (2) dulness in the region of the second and third left interspaces (Gerhardt's ribbon dulness), (3) a prominent conus shadow, and (4) right axis deviation in the electrocardiogram (Fig. 10).

*Comment.*—This is a typical example of a congenital lesion in which symptoms are absent in marked contrast to the prominent physical findings. The frequent development of subacute

bacterial endocarditis renders the prognosis guarded, even though no serious mechanical difficulties are likely to develop.

*Coarctation of the aorta.*—Mechanism. The obstruction to the aorta is usually just beyond the origin of the left subclavian artery, that is, at or near the junction of the ligamentum arteriosum and the aorta. The ligamentum arteriosum is the occluded ductus arteriosus, and it often remains patent when anomalies of the aortic arches are present. Interference with circulation beyond the point of obstruction depends (1) on the degree of coarctation, and (2) on the degree of collateral circulation which can be built up. The latter element, affecting mainly the intercostal arteries and the internal mammary artery and its branches, gives rise to characteristic clinical and roentgenologic findings in the form of pulsating vessels and erosion of the undersurface of some of the ribs (Fig. 11). The obstruction also results in increased pressure in the vessels arising proximal to the point of obstruction. In these cases pulsations in the abdominal aorta and femoral vessels are markedly diminished in contrast to hypertension in the upper extremities.

The syndrome. The syndrome is as follows: (1) a systolic bruit is often present over the base and is easily confused with acquired aortic stenosis, (2) a thrill may accompany the bruit, (3) there is evidence of left ventricular hypertrophy, (4) there is electrocardiographic evidence of left ventricular strain, and (5) there is evidence of the collateral circulation just described.

*Comment.*—Coarctation of the aorta may be latent for years, and congestive heart failure may first bring the patient to a physician. Very frequently, however, the condition terminates fatally as a result of the development of subacute bacterial endocarditis, and not a few patients die suddenly from a ruptured aneurysm of the circle of Willis, which is frequently an associated congenital anomaly. Many patients complain that their legs "go to sleep" very readily because of diminished circulation to the lower extremities. Others live to an advanced age and die from an unrelated cause.

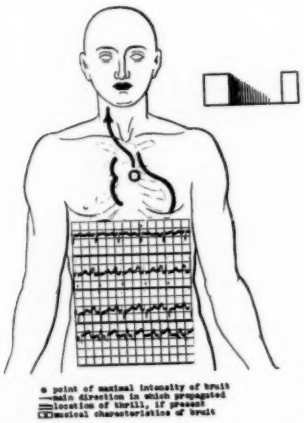
o point of maximal intensity of bruit
—main direction in which propagated
=location of thrill, if present
CH=musical characteristics of bruit

Fig. 9. The tetralogy of Fallot. Note the boot-shaped heart, the right axis deviation in the electrocardiogram, with a positive T wave in the fourth lead (Wolferth). The shading of the lips indicates cyanosis.

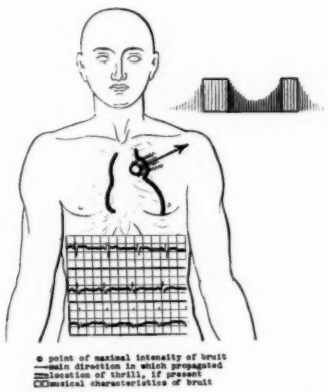
o point of maximal intensity of bruit
—main direction in which propagated
=location of thrill, if present
CH=musical characteristics of bruit

Fig. 10. Patent ductus arteriosus (Botalli). Note the prominence of the conus shadow. The electrocardiogram shows right axis deviation.

*Persistent right aortic arch.*—Mechanism. Physiologically, the mechanism is perfectly normal and represents the avian arrangement. The abnormal anatomic situation, however, especially its relation to the trachea and esophagus, may cause symptoms of pressure referable to these structures.

The syndrome. The syndrome consists of (1) evidence that the ascending aorta is further to the right than normal, namely, dulness to the right of the sternum, pulsation in the second or third right interspaces, maximal intensity of the aortic heart sounds to the right and above the usual location, and strong pulsations in the right supraclavicular fossa; and (2) characteristic

roentgenologic findings, which are (a) a shadow to the right of the sternum running upward toward the right sternoclavicular joint, (b) evidence of displacement of the esophagus and trachea toward the left (this is well brought out by fluoroscopy with a barium-filled esophagus, whereas a stomach tube may be delayed at the point of displacement and transmit the pulsation from the arch of the aorta), (c) absence of the normal aortic knob in the usual situation and the presence of a retro-esophageal aortic knob determined by fluoroscopy, and (d) corroborative evidence is supplied by eliciting, fluoroscopically, a diverticulum-like structure joining the descending aorta which represents the fourth left arch beyond the point of origin of the ductus arteriosus (Fig. 3).

*Comment.*—In most of the cases described, the heart is normal and symptoms may be entirely absent. So-called dysphagia lusoria resulting from esophageal displacement occurs but is frequently absent as in Arkin's[8] cases.

*Congenital anomalies which are rare but in which the diagnosis may be suspected.*—Anomalies of the coronary artery. McGinn and White[7] described the case of an infant who manifested attacks of distress on effort, such as when nursing, while the electrocardiogram showed T-wave changes of the coronary type. The heart was hypertrophied. At necropsy a single coronary artery was found arising from the pulmonary artery. The effects of anoxemia in this case were analogous to those in occlusive coronary disease.

Cor triloculare biatriatum. On the basis of another anomaly the same authors laid down the dictum that when in the roentgenogram a "water-bottle" shaped heart resembling a pericardial effusion is associated with intraventricular conductive disturbances in the electrocardiogram, a three chambered heart of the foregoing type should be kept in mind.

## The Prognosis in Congenital Heart Disease

It is not always easy to prognosticate the future course of congenital heart disease. There is, however, with a few reservations, no reason to deviate from the usual criteria for judging cardiac efficiency. The heart is essentially a muscular pump and its main function is to maintain adequate circulation under the varying conditions incident to the daily life of the individual. With this as a premise, and it is common to all cardiac states, and with the general principle common to the wider fields of diagnostic medicine that an isolated sign rarely has much significance, the degree to which this, its main function, is interfered with in the main establishes the prognosis.

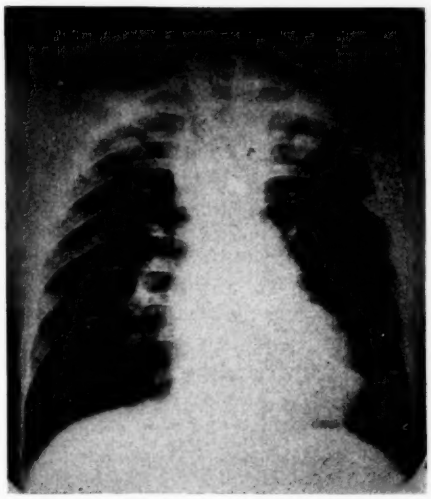

Fig. 11. Roentgenologic appearance of coarctation of the aorta: Note the absence of the aortic knob and the erosion of many of the ribs. The left ventricle is hypertrophied.

The nature and degree of the mechanical disadvantage are the first considerations; hence, again, the importance of establishing an anatomic diagnosis. In states such as patent foramen ovale, patent ductus arteriosus, maladie de Roger, and subaortic stenosis, it may be practically negligible and in spite of loud murmurs there may be little if any interference with the patient's activity. When, however, the degree of altered function is such as to place undue strain on one or more chambers of the heart, hypertrophy, dilatation, and later, loss of cardiac reserve, must inevitably follow. This undue strain is mainly brought about by abnormal shunts of blood through incomplete septa or through stenotic orifices, and finally, through extracardiac factors such as increased pressure within the pulmonary circuit. Evidence of hypertrophy or enlargement of individual chambers or of the heart as a whole then definitely

influences the prognosis adversely, according to the degree of such enlargement.

The reservations previously referred to are occasioned by the vulnerability of the congenitally anomalous heart to rheumatic fever, by the frequency with which subacute bacterial endocarditis becomes engrafted upon it, and by the sudden death of an individual in apparently good health. Abbott's statistical studies supply enlightening information regarding the termination in various types of congenital heart disease.[2] Small interventricular septal defects with patent ductus arteriosus may interfere very little with activity, but in from 20 to 25 per cent of cases of both types subacute bacterial endocarditis develops. In contrast, a widely patent foramen ovale is hardly ever the basis for such a complication, but in about half the cases congestive failure eventually develops. For the group of cases in which lesions involve the pulmonary infundibulum, with or without associated ventricular septal defects and the different degrees of transposition of the great vessels, the prognosis is not good. Cyanosis is likely to develop early and to be progressive, and incapacitation is the rule. Subacute bacterial endocarditis terminates life in more than 20 per cent of this group.

The individual with coarctation of the aorta leads an existence beset with even more hazards. About a third of the patients die with congestive failure; subacute bacterial endocarditis claims about 10 per cent. An unexpected and dramatic termination is not infrequently the result of a subarachnoid hemorrhage due to rupture of an aneurysm of the circle of Willis, and rupture of the proximal part of the ascending aorta not infrequently occurs. Of Abbott's seventy patients with the adult type of coarctation, twenty-two died suddenly. Headaches, convulsions and other neurologic complications have been commented on.[15]

In spite of mechanical disadvantages and unpredictable hazards, however, remarkable instances of longevity have been recorded. Thus, Firket's patient,[10] a woman with combined mitral stenosis and an auricular septal defect, went through eleven pregnancies and three abortions and lived to the age of seventy-four. Lutembacher's patient,[11] also a woman and with the same type of lesion, lived to be sixty-one years old and went through seven pregnancies without heart failure, and two other patients with the same types of lesions lived to the age of seventy-four and sixty-two years, respectively.[6] White and Sprague's[14] case of the tetralogy of Fallot was even more remarkable. The patient, although cyanosed, lived a full life and died at the age of fifty-nine years and eight months. Erickson and Willius[9] reported a case of widely patent foramen ovale, so wide that a normal heart could be fitted snugly into the opening; yet the patient, a man, lived to be seventy-one years old.

## Summary and Conclusions

A study of the embryology and comparative anatomy of the heart is essential in understanding the genesis and mechanism of human congenital cardiac anomalies. A number of these congenital lesions are recognizable clinically. The syndromes diagnostic or suggestive of interventricular and interauricular septal defects, including Lutembacher's disease, subaortic and pulmonary stenosis, the tetralogy of Fallot, patent ductus arteriosus, coarctation of the aorta, persistent right aortic arch, one type of coronary artery anomaly, and the cor biatriatum triloculare have been described.

While electrocardiographic evidence is important in the recognition of congenital heart disease, there is no diagnostic picture for any type except congenital dextrocardia with complete situs transversus.

The uncomplicated septal defects, patency of the ductus arteriosus, subaortic stenosis, and persistent right aortic arch may interfere with activity only to a limited extent, but the frequent occurrence of subacute bacterial endocarditis as a complication renders their prognosis guarded. Occasionally, an individual with a gross cardiac defect lives to an advanced age.

N. B.: All the illustrations used in this paper have been taken from a previous paper: An approach to the diagnosis of congenital heart disease. Am. Heart Jour., 14:135-154, (Aug.) 1937.

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# POLYNEURITIS IN CHILDREN*

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THE frequency of recent publications concerning Vitamin B, its components and related substances induced a request for a résumé of peripheral neuritis in children. When I agreed to prepare such a summary, it was my impression that patients suffering from polyneuritis were admitted to the University Hospital fairly frequently, and that a considerable group of case histories could be collected for analysis. This impression proved erroneous. Despite its apparently low incidence among the children of Minnesota, the prolonged and severe disability requiring nursing care, physiotherapy and, in some cases, orthopedic surgery make the condition an important one.

The gross pathology of polyneuritis is usually very minimal although some swelling and congestion of the peripheral nerves may be detected. Microscopic sections prepared with special stains will show disintegration of the medullary sheaths with lipoid deposits within the sheaths. There is usually some evidence of phagocytosis. Spindle shaped enlargements and granular degeneration of the axis cylinders may be seen.

The symptoms of polyneuritis are usually both sensory and motor. The motor symptoms begin with weakness which, in the more severe cases, progresses to flaccid paralysis with impairment or loss of deep reflexes. Sensory symptoms include pain, paresthesia, hypesthesia and less frequently anesthesia. Customarily the lower extremities are first involved with progression to the upper extremities and trunk. The distribution is roughly symmetrical.

General treatment during the active stage consists of supportive measures, elimination of foci and sources of toxin, improvement of nutrition, protection of the weakened muscles and the use of oxygen when the muscles of respiration are involved. As recovery progresses, physiotherapy and orthopedic appliances are usually indicated. Finally, surgery may be required to decrease disability where recovery has been incomplete. Specific measures are indicated where a specific etiology can be determined.

Many factors have been incriminated as etiologically important in the production of polyneuritis and the disease is roughly subdivided according to the supposed etiology.

Metallic poisoning, either accidental or as a result of therapy, accounts for a considerable proportion of these cases. Of the metals, the most frequent offender is lead. Lead may be ingested by children as a result of chewing paint from furniture and toys. Food and water may become contaminated from pipes or containers. Insecticides and sprays are other possible sources. Several children have acquired lead poisoning as a result of collecting foil or from molding toys with small casting sets. Children are infrequently exposed to lead directly from industrial sources but may be indirectly endangered as was the case when battery cases were used for fuel.

Four of the cases of polyneuritis in children admitted to the University Hospital in the past ten years proved to be cases of lead poison. Of these, two resulted from collecting foil. In one case foil was recovered from the feces. The other two were brothers who lived on a farm

*Read at the annual meeting of the Minnesota State Medical Association, Duluth, Minnesota, July 1, 1938.

where a lead spray was used, but the exact mode of ingestion could not be determined. Confirmatory evidence by chemical analysis and by demonstration of a lead line in x-rays of the long bones was present in three of the four cases. In the fourth, positive x-rays were not obtained until approximately a year after the onset of the neuritis. Other findings which sometimes aid in confirming the diagnosis were absent in all four cases. These include anemia, stippling of the erythrocytes and a blue lead line at the gum margin. All four patients were markedly improved at the time they were last heard from.

The prognosis for complete recovery after lead polyneuritis is not as good as after most types because there is apparently a more marked involvement of the spinal cord. In the cases presenting evidence of lead encephalitis the prognosis is considerably worse.

Special therapy during the active stage is aimed first at removal of the lead from the blood stream and later at removal of the lead from the body. The first is attempted by giving calcium, phosphorus, large doses of vitamin D and alkalies. Removal of the lead from the body is attempted by the use of the ketogenic diet, acids and parathyroid extract.

Arsenic is another metal which is capable of producing polyneuritis. In these cases the source is usually arsenic administered therapeutically either as an antiluetic or as a tonic. Accidental ingestion of rodent poison or insect spray is a less common source. Elimination of arsenic may be hastened by the use of sodium thiosulphate.[1]

Since the substitution of x-ray for thallium as a depilatory, especially in the treatment of ringworm of the scalp, children are infrequently exposed to this metal.

Recently bismuth has been used in place of mercury as an antiluetic and a few cases of polyneuritis from this source have been reported. They closely resemble the polyneuritis of lead and produce the same x-ray findings.

Cases of polyneuritis due to or associated with infections are less readily classified. That following diphtheria is considered the most common type in children. Diphtheritic polyneuritis is almost invariably preceded several days by local paralysis such as the paralysis of soft palate and pharynx associated with faucial diphtheria. Neuritis occurs almost exclusively in cases where antitoxin has been administered late or in inadequate dosage. The multiple neuritis usually appears from three to eight weeks after the onset of the disease. Weakness of the extremities with loss of tendon reflexes and tachycardia are the characteristic findings with sensory changes much less prominent. The extremities are most severely involved but neck, trunk and respiratory muscles may also be affected. No cases of diphtheritic polyneuritis have been admitted at the University Hospital in the past ten years. Only once was the diagnosis made at the Minneapolis General Hospital during that period.

A much smaller group of cases has been reported in which the neuritis developed several days after a brief febrile illness of undetermined origin.[9] The polyneuritis in these cases is roughly symmetrical, usually associated with bilateral facial paralysis, frequently affecting proximal muscle groups of the extremities more than the distal groups. The causative organism is unknown and more than one may be responsible. If the acute stage is survived, recovery is usually rapid and complete. One case at the University Hospital may represent this group. Ten days after the rapid development of weakness and paresthesia in arms and legs the patient was markedly improved and after two months his only complaint was that he tired more rapidly when running. Chemical, x-ray and blood tests were all normal at the time of his admission. Interpretation of his spinal fluid examination was obscured by a bloody tap previous to admission.

Periarteritis nodosum is said to be accompanied by polyneuritis in 20 per cent of the cases.[6] It occurs rarely and the neuritic symptoms are likely to be overshadowed by the other symptoms of the disease.

Polyneuritis occasionally complicates other diseases, notably tuberculosis, typhoid, paratyphoid, malaria, septicemia, pyogenic infections, scarlet fever and mumps. Diabetes in children is rarely complicated by polyneuritis. Two of the most frequent causes in adults, chronic alcoholism and pregnancy, are rarely encountered in children.

Some of the cases can only be classified as chronic polyneuritis of unknown origin. These usually develop progressively over a period of months or years until there is almost complete paralysis of the extremities and trunk. Even after this extensive involvement, slow but com-

plete recovery is possible.[2] Two of the cases at the University apparently fall in this group. The history of one is particularly striking. An eight-year-old girl began to complain of pain in the legs and gradually developed a peculiar dermatitis. Weakness of the extremities began to develop after three or four months and progressed until the voluntary muscles below the mandible seemed almost completely paralyzed six months after the onset of the illness. For one week there was considerable difficulty with respiration. Approximately one year after the onset of the illness, while the child was at home, improvement began and continued until she was able to propel a wheel chair after another six months. When an orthopedist examined her six years after the onset of the illness he detected only a slight weakness of one foot for which exercise but no appliance was recommended.

Several drugs other than the metals previously mentioned have been cited as causes of polyneuritis. Among these are dinitrophenol, atabrine, sedatives of the chloral group, and, rarely, anesthetics including ether and novocaine. Occasional cases have been reported following the administration of foreign protein such as therapeutic sera.[12] Hematoporphyrinuria[5] and hematoporphyrin hydrochloride[10] used therapeutically may also cause polyneuritis.

Dietary deficiencies are known to be capable of causing neuritis. Classical beriberi as seen in the Far East and infrequently in the U. S. is the best example of polyneuritis definitely on a dietary basis. Much less frequently, neuritic symptoms may result from restricted therapeutic diets as used for gastro-intestinal disease and food allergy as well as the ketogenic diet, if no allowance is made for an adequate vitamin intake.

Wechsler[11] in 1932 expressed the opinion that vitamin deficiency is necessary for the production of toxic neuritis of obscure origin and is also partially responsible for some cases in which a specific poison is at fault. This may account for individual differences in susceptibility.

Strauss[8] gives one the impression that all types of peripheral neuritis, except those due to diphtheria, those associated with acute febrile disease and those due to exogenous toxins such as lead and arsenic are due to vitamin B deficiency. He believes that pregnancy, chronic infection, alcoholism, etc., provoke polyneuritis by decreasing the intake and absorption of vitamin and increasing the requirement. Spies,[7] Jolliffe,[3] Romano[4] and their co-workers agree that this is the case in polyneuritis of pregnancy and alcoholism.

Until recently, massive doses and parenteral administration of Vitamin B has not been practicable. Since $B_1$ is now available in pure concentrated form, information should soon be available concerning its use in the less common types of polyneuritis.

Nicotinic acid, which has proved quite effective in the treatment of canine black-tongue, a disease resembling pellagra, and of some of the symptoms of pellagra, seems to be quite ineffective in the treatment of the neuritic symptoms.[7] Whether the components of the B complex other than $B_1$ are likewise unimportant in the treatment of neuritis and whether large doses of $B_1$ orally or parenterally will have any beneficial effects in the treatment of polyneuritis following diphtheria, the metallic and drug intoxications remains to be determined.

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## Discussion

DR. J. C. MCKINLEY, Minneapolis: Dr. Cutts has presented the important etiologic factors of peripheral neuritis and has assigned vitamin $B_1$ about the place that seems reasonable at the present stage of its investigation. Because of the variable severity and irregular duration of polyneuritis, it is difficult to assess the value of a single factor without painstaking clinical work under practically experimental conditions.

Most clinicians are unaware of an observation by neuropathologists which may partly explain the greater frequency of polyneuritis in adults as compared with children: namely, the fairly common occurrence with advancing years of arteriosclerosis of the vasa nervorum. Obviously a condition of decreased blood supply to the nerve would predispose to nerve injury on the superimposition of toxin, poison, vitamin deficiency or what not. This condition is being given detailed study at the present time in our Neuropathology Laboratory at the University of Minnesota.

# WHAT IS NEW IN THE FIELD OF FOOD-SENSITIVENESS*

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I HAVE been asked to tell you today of what's new in the field of food-sensitiveness. I use the word sensitiveness and not allergy because I feel so sure that food-sensitiveness is not always due to allergy; much of it is due to irritant or slightly emetic drug-like substances.

The first point I want to make is that in spite of doubt, amusement, and apathy in some quarters, the recognition of the importance of food-sensitiveness in the production of many puzzling syndromes is now spreading rapidly through the profession. In fact, interest has already reached that to-be-expected stage in which some men are so enthusiastic that they are seeing "food allergy" everywhere, and are beginning to starve their patients right and left.

Actually, the subject of food-sensitiveness must be of interest to everyone in medicine because one in every four dyspeptics is sensitive to at least one food, because specific reactions to food can upset the functions of so many of the organs of the body, and because every so often the physician can work a miracle by removing one or more articles from a patient's diet.

The physician is particularly likely to forget food-sensitiveness or to pooh-pooh the idea that this might be the cause of symptoms when he is dealing with a thin, frail, neurotic woman with a lot of curious aches and pains. It is so easy, and generally so sensible, to assume that all these symptoms are due to nervousness, fussiness, and constitutional inadequacy, but occasionally the physician will be wrong as I was awhile ago. For weeks I struggled in vain to help a thin, nervous woman who, in spite of everything I did, went on losing weight and having one migrainous headache after another. She had told me that she suspected that she was so sensitive to milk that she couldn't even touch butter, but since in years I had seen but two or three patients as sensitive as that, I had taken the statement with a large grain of salt, as we physicians so commonly do when a story does not hang together very well. Finally, in desperation, when my usual elimination diets did not help, I acted on her suggestion and removed every trace of milk and butter from her food, whereupon she lost her headache and misery and depression, and began to gain steadily in strength and comfort. Actually, it appears now that she can stand a fairly liberal diet so long as every trace of milk is kept out of the food. Even her bread has to be made without milk.

## The Trouble Is Not in the Patient's Head

Now, a few years ago, I would have said, as some of you are thinking right now, that this sort of thing is in the patient's head, and that a physician who can believe such tales must also have something wrong with *his* head, but after the miracles of healing that I have seen in the last few years and after the remarkable improvement in my own bodily comfort that has come since I discovered the several decided sensitivenesses to food which, unrecognized, hounded me for most of my life, I am prepared for anything.

One must admit that the trouble is not in the patient's head when one learns that every so often, in spite of all his efforts to avoid his bête noir, he gets a bad upset due to eating the offending substance well concealed in other foods. For instance, a patient who knows of his great sensitiveness to chicken could not be hired to eat a piece of the meat, but for awhile after the discovery of the cause of his attacks of bloating, diarrhea, and mental depression he kept getting upset occasionally with the well-known syndrome, and each time a little detective work showed that the harmless-looking cream soup he had eaten for dinner had been made with chicken stock. He knows now that he must not even taste a soup of doubtful origin, because if it be made from chicken, two tablespoonfuls are enough to give him abdominal pain, a restless night and a headache next day.

Other patients who are highly sensitive, to, let us say, cottonseed oil, when away from home do not dare to touch anything fried, or any pastry made with shortening, or any salad with a dressing. They cannot recognize the nature of the fat used by its taste, and when a few hours later, the

*From the Division of Medicine, The Mayo Clinic, Rochester, Minnesota. Read before the annual meeting of the Minnesota State Medical Association, Duluth, June 30, 1938.

retching starts, it is too late to do anything about it. No, the trouble is not in their heads.

### Two Problems Today

Curiously there are two big problems today in the field of food-sensitiveness: one is to get more physicians to wake up to the importance of the subject, and to keep on the watch for patients whose indigestion, headache, or mental hebetude is due to the eating of some food; and the other is to keep a few physicians from becoming so enthusiastic over the miracles that they have performed that they will starve patients unjustifiably, and for too long a time. Every so often now I see persons who have lost anywhere from *20* to *60* pounds in weight from having been left too long on either an elimination diet or a diet lacking a score of important foods. Usually the eating of these foods was forbidden simply because the skin happened to react to them; a little testing would have shown that these reactions had no significance and that the patient's symptoms were not due to the eating of any of the foods.

### Skin Tests

Actually, no one should trust skin tests so implicitly. They are of considerable value in the search for the causes of hay fever, asthma and eczema, but commonly they are useless in the search for the causes of abdominal distress and headache. They are of so little value that we at The Mayo Clinic seldom use them for this purpose unless we are desperately in need of a hint, or we fear that if we do not use them a much-traveled and doctored patient will think we were negligent. Often the tests are nothing but a nuisance as when a fussy woman who has seen that her skin responded to certain foods, refuses ever to touch them again. Actually, no one should ever stop eating a food simply because the skin on one occasion reacted to it with a little wheal. One should reject a food only when it is found, on repeated trials, that every time it is eaten distress follows.

But if the skin tests are of little value, what is one to use? How about the leukopenic index: the test in which the leukocyte count goes down when the offending food is eaten? My impression is that this is too time-consuming and expensive for ordinary use. Furthermore, unless the counts are made most carefully with the patient under basal conditions, the conclusions drawn are likely to be erroneous. As Garrey has shown, the leukocyte count varies markedly from hour to hour during the day, and worse yet, there is no such thing as an errorless count. Even the most practiced girl cannot get five counts on the same blood to come out the same.

### The Diary Method

I prefer to use two methods which are simple, practical and inexpensive, and likely to give conclusive results. When the indigestion or pain or headache comes in attacks at intervals of days or weeks or months, the best way of finding the offending food, granting that there is one, is to have the patient make each time a record of the unusual foods—not eaten every day—consumed in the twelve hours preceding the upset. Most suspicion should fall on food eaten at the preceding meal, because in most cases distress follows within a few hours after the eating of an injurious substance.

Most patients in trying to keep a diary make the mistake of putting down everything they eat, with the result that they pile up such a mass of data that they cannot learn anything from it. If, for example, a man gets his distress some day just before noon it will be silly to make note of orange juice, toast, and coffee if these are the foods eaten for breakfast day after day, when no symptoms follow. But, if on the particular morning the man broke his usual custom and drank chocolate instead of coffee, that is something to make note of.

After the patient has suffered three or four attacks the record should be examined to see if there was any one food eaten before each upset, and followed by distress every time it was eaten. If such a food is identified, it should then be left alone for awhile to see if the patient remains well. If relief is obtained, then the food should be eaten again and tested at least twice to see if its ingestion always brings an attack. If it does, this food should obviously be crossed off of the person's diet list. If it should be a food commonly used, like milk or egg, then the patient should make a study to see if he can take small amounts at intervals, or if he is so sensitive that he must not touch cake, puddings, and other foods containing milk and egg.

It is well that the patient in the diary make note, also, of any unusual fatiguing or upsetting incident that occurred before an attack, or of severe constipation, or the coming of a migrainous

headache, menstruation, or a cold. Often such happenings are more productive of the symptoms than are changes in diet.

### The Elimination Method

When the distress that the patient complains of is present every day, the problem of finding the offending food or foods must be simplified by reducing the number of possibilities. To do this I generally ask the patient to eat *nothing* for two days but lamb, rice, butter, sugar, and canned pears. I use these foods because I know from experience that they seldom cause trouble even in highly sensitive people. Occasionally, when the patient assures me that when he lives on nothing but buttermilk, or, let us say, beef, asparagus and string beans, he is well, I gladly start with those foods as an "elimination diet." The battle is all but won as soon as *any diet* is found on which the patient will lose his symptoms.

Every month I see highly allergic patients who searched for offending substances in the diet and failed to find them, usually because they were unwise in their choice of foods for the first elimination diet. Thus, I recently saw a woman who started off with milk and custards, which was about as bad a choice as could have been made because milk and eggs are among the commonest of offending substances. Worse yet, she kept on hopefully with this diet for a month in spite of the fact that none of the symptoms cleared up. Other patients fail in their search because their method is to give up first one food and then another. Since most food-sensitive persons have trouble with several articles of diet, it is obvious that this plan of eliminating one food at a time will seldom yield any information.

Usually, if the patient's troubles are due to food-sensitiveness, and the elimination diet used happens not to contain any of his particular offenders he returns *next day* to announce that the soreness and gas have gone out of his bowel, and his head feels clear again. Especially when the patient volunteers the statement that his head feels right again, I know that I have eliminated some injurious food, and I am almost certain that I am going to work a cure. All that remains then to be done is to add a food a day, testing one after another until all the offenders are found.

Usually I start testing foods that are not very common offenders because I don't want to begin by upsetting the patient and discouraging him, and especially if there has been great loss of weight, I want him to gain a little before I start "rocking the boat." Usually I begin by adding foods such as gelatin, carrots, asparagus, string beans, rye krisp, arrowroot cookies, turnips, potato, beef, apple sauce with tapioca or sago, and thin, well dextrinized toast. As soon as the patient has gained confidence and is satisfied that his trouble is due to food-sensitiveness he can begin to experiment with such common offenders as milk, chocolate, egg, and coffee.

If, however, the patient does not, in twenty-four or forty-eight hours, improve on the elimination diet of lamb, rice, butter, sugar and pears, the physician must *immediately* face two possibilities: either the patient's troubles are not due to food-sensitiveness, or else they are due to the eating of one or more of the five foods supplied. Oftentimes in the two days of observation a woman will show herself decidedly unreasonable and cantankerous; she will fuss and complain bitterly of her deprivations, or she will cheat or refuse to coöperate, or it will come out that the trouble with her is that she can't stand the appearance or the smell of the food, or that she becomes nauseated if it looks greasy, or that she becomes ill the minute she eats. The physician will then be almost certain that he is dealing primarily with either a nervous hypersensitive person, or a spoiled, undisciplined fuss-budget, or someone with but little gray matter between her ears. This, of course, is most helpful information because it will show the physician right off that he is never going to find any diet that will help, and he might as well stop wasting his time. The obtaining of such valuable information so quickly is one of the most useful features of the elimination type of diet, and one that, so far as I know, no one has as yet mentioned. This ability of the diet to unmask immediately overly nervous, psychopathic and uncoöperative patients should cause it to be used daily even by those men who do not believe in food-sensitiveness. In other cases the failure of an elimination diet to help a women with a sore, gassy abdomen will strengthen the physician's suspicion that the trouble is due to an inflammation of the gallbladder.

But to get back: if the patient appears to be sensible, and the symptoms and history strongly suggest an allergic disturbance, the physician

will not give up but will try another simple elimination diet consisting, let us say, of beef, asparagus, string beans and gelatin. If this doesn't help in two days the chances are that the trouble is not due to any food. However, if the physician still thinks the symptoms should be allergic in origin and due to food, he can ask the patient to take nothing but water or only a little maple sugar for forty-eight hours. Then, if the discomfort persists, it is hardly likely that it is due to a food, and the patient might as well go back to a full diet.

The point that I would like now to hammer home is that an elimination diet is to be used for diagnosis and not for long-continued treatment. Occasionally a woman will be so delighted with the relief obtained on an elimination diet she will go back home, content to live indefinitely on her five foods, or if she does report back to her physician, it will be hard to get her to try any new ones. Usually, however, she is glad to have a wider choice, and always she must be helped to get back onto as full a diet as she can tolerate.

There is one group of persons who may have to be kept for several weeks on an elimination diet before one can be sure of the effect, and this is the group of patients with migrainous headaches who have only one or two a month. They should be given a little more liberal list so that they can maintain nutrition and not get too disgusted with the foods eaten day after day. In such cases Rowe's diets are helpful.

### The Problem of Persons Highly Sensitive to Many Foods

Unfortunately, there are some persons who are so sensitive to so large a number of the common foods that the physician must make a big effort to supply substitutes and sufficient vitamins and calcium. Unfortunately, in our newly aroused enthusiasm for allergy, some of us physicians are doing today with foods what we for long have been doing with teeth: day after day we order teeth removed but we seldom bother to see to it that the patient puts back bridges or plates. Today foods are blithely being taken away from patients, without even a suggestion as to possible substitutions.

We physicians should be making a greater effort to help all highly food-sensitive persons, and especially those harrassed mothers who have to bring up asthmatic children that cannot touch many of the commonly used foods. A few allergists located in large cities are now inducing one or more bakers to prepare breadstuffs without wheat, milk or egg, and doubtless before long such foods will be prepared for shipment to patients everywhere.

There is need also for better labeling of foods. How, for instance, is a wheat-milk-sensitive person going to know whether or not he can eat an "arrowroot cookie"? Does it contain a little wheat and perhaps a little milk or does it not? Or how is the person tremendously sensitive to cottonseed oil going to know for certain that the "olive oil" he buys will not start him to retching when he puts a little on his salad?

### The Need for Searching the Food Markets of the World

For those few persons who are highly sensitive to many foods we physicians must reach out into foreign countries to find substitutes: foods to which the man should theoretically not be sensitized because he never ate them before. Unfortunately highly sensitive persons will react badly to foods that they probably never ate before, but some harmless ones are likely to be found during the search. Particularly useful are some of the foods that constitute the "staff of life" for peoples in other countries. Probably the best is rice; it has no distinctive taste, and most persons can eat it daily without tiring too much of it. Other good starchy foods to try are barley, oats, rye, millet, lima beans, sago, and the several types of tapioca and arrowroot. Incidentally, I have solved the puzzle of how to give sago, tapioca and arrowroot without milk or eggs by having these starches cooked in apple sauce or mutton broth. Raw apples stand very high in the list of offending substances, but cooked apple seems seldom to give trouble. It is possible that a flour glutinous enough to serve as a binder in baking rice flour could be made from the banana, or from taro—that big starchy tuber which used to be the principal source of food in many parts of Polynesia. Taro flour, which makes a good tasty breakfast mush, is now being canned in Hawaii, and it should be a boon to many food-sensitive persons.

An excellent source of protein, carbohydrate, and fat is the tasty garbanzo or chick pea, which is a great favorite in Spain. The soy bean is good because it contains protein, carbohydrate and fat. Fortunately a way has now been found of remov-

ing its unpleasant taste. Dates supply much of the nourishment of the Arab. The avocado or alligator pear is now being raised cheaply in this country, and it can supply much needed fat to some patients. Persons highly sensitive to corn oil or cottonseed oil or to butter might try out a number of the oils that are derived from certain seeds such as sesame and rape.

A new science of world-wide dietetics remains to be opened up, and the day is coming when some grocery stores will carry a special line of unusual foods for the highly allergic person. Every minor constituent of these foods will be stated on the label, and the product will be guaranteed by the manufacturer to be exactly as stated. At present the food-sensitive person who lives in a large city can often enlarge his diet by going down into the foreign quarter and rummaging through the stores which supply immigrants with the foods eaten in their respective countries. In this way one of my badly starved, highly allergic patients obtained dried lichi nuts and chestnut flour from China, big fava beans and garbanzos from Spain, cassava flour from Africa or Brazil, and soy beans from Manchuria, all of which have been life-savers to her. When she came to me, she was living on only two foods and was down to skin and bones.

### The Need for Taking Foods in Rotation

There is another helpful suggestion that I can make to the highly sensitive person, and that is to take in rotation the few foods that he can still eat. He must remember, first, that he is more easily sensitized to new substances than are most persons, and second, that whenever he finds some new food that works well, he is likely to eat it in such large quantities every day that he can hardly help becoming sensitized to it. As a result he soon is back where he was before, on starvation rations. Some time ago one such patient, who was nearly at the end of her rope and facing starvation, wrote me that she had solved her problem by taking in rotation a number of foods to which she was only slightly sensitive. By partaking of each food only once in ten days she didn't suffer much, and she did not increase her sensitiveness to the foods. I have since found this procedure very helpful. Fortunately, many persons so sensitive to, let us say, eggs, that they cannot take one every day without getting into serious trouble, can eat one occasionally with only slight discomfort.

Another new science awaits development and that is the science of so treating foods chemically that the harmful substances will be "denatured" and rendered innocuous to sensitive persons. Here is a chance for some young chemist who would like to be another Pasteur; the field awaits him.

### Summary

Food-sensitiveness is common enough and important enough so that physicians practicing in many fields must be on the watch for it. It can be the cause of the symptoms even in neurotic and constitutionally inadequate persons. The trouble is certainly not in the patient's head. He has it before he even thinks it is due to food, and every so often he is poisoned by inadvertently eating his offending substance concealed in other foods.

Skin tests are seldom of much value in finding the offending foods. One must not trust them but must test each food by having the patient eat it.

When the upsets come at intervals the patient must keep a record of *unusual* foods eaten before the symptoms appear. If some one food is found to have been eaten before each attack it should be tested several times to see if it always causes the trouble. It should then be avoided to see if without it the patient can remain well.

If the distress is present every day a narrow elimination type of diet must be used. If on this the patient becomes comfortable, one food after another must be tried until the offenders are found and eliminated. If after a day or two on the elimination diet the patient does not get well, the physician must *immediately* face two possibilities: either the troubles are not due to food-sensitiveness or else they are due to the eating of one or more of the few foods supplied. Often during the two days of testing a patient will show herself so overly fussy or psychopathic or unreasonable or uncoöperative or stupid, that it is obvious that nothing can be gained from further dietary tests.

In other cases it may pay to shift to another simple elimination diet or to have the patient take only water for two days. If then the symptoms persist, it will be obvious they are not due to food.

A few persons are so sensitive that great search must be made through the markets of the world for new foods which they can eat. Some of these foods are described.

Patients who are highly sensitive to many foods should eat in rotation the few that they can still eat so as not to become sensitized to them.

### Discussion

DR. E. M. RUSTAN, Minneapolis.—I think that Dr. Alvarez has covered a very difficult subject in a most complimentary manner. His experience in these matters makes it possible for him to evaluate the efficacy of the various tests, and his warnings are most timely.

Hypersensitivity to food has received a great deal of attention during the past few years. The reason for this is that specialists, other than allergists, realize and recognize that food may cause symptoms previously inexplicable. Since this has occurred there is enthusiasm, as in any new phase of medicine, which in time disappears, and the true value of the subject remains. A few years ago most food sensitive patients were treated as neurotics by empirical methods of diet and change in environment. It is true that so called "neurotic complaints" are present in a high percentage of these patients, but it appears that as our diagnostic acumen increases the group of patients diagnosed as neurasthenics becomes smaller.

The greatest difficulty confronting the physician, in making a diagnosis of food hypersensitivity, is the interpretaion of the laboratory tests in common use. As the author has stated, skin tests are rarely of value in allergic gastro-intestinal disease or in allergic headaches. The tests are of most value in the atopic diseases, but their interpretation always depends upon the individual experience of the physician. Passive transfer tests, when positive, are of importance. However, in adults a strong reactor is oftentimes known to be the cause of symptoms. Leukopenic index tests may be used to a great advantage in some conditions. In many instances the combined results of all the laboratory tests give no specific information, and because of this the patient and the physician are oftentimes misled. Skin tests, leukopenic index tests, and passive transfer reactions do not determine the allergic status of the patient, and should be used only as aids in diagnosis.

After the food sensitivity has been proven, the management of these patients also presents difficulties. Dr. Alvarez has brought this out very graphically and he has emphasized the need for careful study, not only of the individual foods but also of the other foods that may be substituted. Avoidance of the causative agent or agents is the simplest manner of treatment in the majority of instances, as about 50 per cent of these patients may again take foods to which they were sensitive without producing symptoms, after a few weeks or months. Some foods such as wheat, eggs, and milk cannot be avoided because of age, geographical location, and finance. In these instances alteration of the foods by heating or oral hyposensitization is worthy of trial. If this is unsuccessful subcutaneous injection of a properly prepared extract should be tried.

In general the results of treatment depend, to a large extent, upon the physician's knowledge of allergy, and above all else the intelligent coöperation of the patient.

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## A TYPE OF CHRONIC NERVOUS DEPRESSION IN WOMEN RELIEVED BY THE ADMINISTRATION OF THYROID EXTRACT*

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THE clinical picture of myxedema with its objective findings of non-pitting edema, swollen face, supraclavicular pads of fat, coarse dry skin, sparse hair, stupid expression, slow movements, the patient's subjective feelings of lassitude, easy fatiguability, loss of initiative, poor memory, impaired concentration, and mental sluggishness is too well known to warrant description here. That an actual psychosis can form part of the clinical picture of myxedema is also well known. Wagner von Jauregg[5] said that 15 per cent of all patients with myxedema have psychoses. Karnosh and Williams[2] in a recent survey of a series of cases were able to corroborate this figure.

The reaction pattern of the psychosis of myxedema is a non-specific one. Ziegler[6] feels that the symptoms evoked by the general physical depression of myxedema are "individual expressions of latent hereditary disposition and constitutional tendency." The most frequent type of true psychosis seen in myxedema is what Adolph Meyer has called the dysergastic reaction. This is a delirious-hallucinatory episode characterized by clouding of consciousness which may extend to complete disorientation, unsystematized delusions of persecution, and excitability. When this reaction appears as one of the clinical manifestations of myxedema it is readily relieved by adequate doses of desiccated thyroid gland. In addition to the dysergastic reaction, other psychotic manifestations may exist as part of the clinical picture of myxedema. Moreover, the psychic manifestations may exhibit themselves before the classical physical appearance of myxedema is established.

During the past few years I have observed several patients who have exhibited a number of functional symptoms in common. It is my purpose in this brief paper to describe what I believe to be a clinical syndrome. No attempt

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will be made to expound the deeper philosophical minutiæ which the consideration of any psychopathological condition necessarily implies. The patients that I have in mind all were women, they all were in the 5th decade of life, they all were over weight, their basal metabolic rates were not reduced markedly if at all, the prevailing emotional tone was one of moderately severe depression without delusional formation, and the patients all were normalized by the administration of desiccated thyroid gland. Every patient had consulted numerous physicians, had received varying doses of bromide and other sedatives without relief, had listened to the usual "pep-talks" and other attempts at psychotherapy, all to no avail. Before receiving desiccated thyroid they had been suffering for from several months to several years in a state of chronic anxiety and moderately severe depression. They were given thyroid extract and, without sedation, without psychotherapy and without any supervision whatever of their life activities, they became physically and psychologically normal.

## Case Reports

Because of limitations of time and space, only three illustrative cases will be reported. Numerous other cases have been seen in private and dispensary practice. Only relevant psychiatric data will appear in the case reports.

*Case 1.*—Mrs. D. L. L., a divorced housewife, aged forty-two, was first seen by me in the Ancker Hospital Dispensary, Saint Paul, on June 18, 1935. Eight years previously she had had an hysterectomy and since that time there had been hot flashes and amenorrhea. In addition she was depressed and disinterested in her surroundings. Although there were no specific preoccupations, Mrs. L. had frequent crying spells, felt worse when she awakened in the morning, entertained thoughts of suicide, and felt extremely hopeless about the future. The physical and neurologic examinations were negative. The serologic tests on the blood and cerebrospinal fluid gave negative results; Hb. 91 per cent; R.B.C. 4,860,000; W.B.C. 8050 with a normal differential distribution; B.M.R. —13 per cent. Examination of the expressed gastric contents after a test meal gave normal values for HCl. The patient's weight was 210 pounds; pulse 76, temperature normal. Mrs. L. was placed on desiccated thyroid and almost at once began to feel better. I saw her at weekly intervals for the first two months, and the thyroid dosage was regulated to produce weight loss and to support the emotional tone without producing toxic symptoms. Mrs. L. now weighs 188 pounds (a loss of 22 pounds), her basal metabolic rate is +9 per cent, and she feels perfectly well. Her maintenance dose is 2 grains of dessicated thyroid daily.

* * *

*Case 2.*—Mrs. A. J. E., a married housewife, aged forty-two, was first seen by me at Ancker Hospital Dispensary on June 4, 1937. At that time she was suffering from what appeared to me to be a typical involutional depression. She was depressed and disinterested, had daily crying spells, felt worse in the morning, and had a great variety of somatic preoccupations. She was afraid that she was going blind, afraid that she would lose her mind, afraid that she had abdominal cancer, and she tearfully resented any suggestion to the effect that she might be mistaken. From the very first interview she seemed to be on the defensive, and interrogation revealed the fact that she had consulted a number of physicians and had been told that there was nothing wrong with her, that it was "all imagination," and that she should "snap out of it." She had taken large amounts of sedative, all without relief. The physical and neurologic examinations resulted in negative findings throughout. Hb. 82 per cent; W.B.C. 8350 with a normal differential distribution; urinalysis normal; gastric expression not permitted, and the basal metabolic rate not determined because of a technical difficulty in the laboratory at the time. Serologic tests on the blood and cerebrospinal fluid were negative. The weight was 194 pounds, pulse 100, and temperature normal. Mrs. E. was placed on 2 grains of desiccated thyroid daily, and one week later reported that she was feeling better. Two weeks later the weight was 187 pounds, pulse 96, and she reported that she was feeling much better during the day but was unable to sleep at night. One month later her weight was 181 pounds, pulse 96, and the patient reported satisfactory progress. On August 26, 1937, she reported that she was very nervous. Her weight was 178 pounds, pulse 98, and the basal metabolic rate was +34 per cent. Thyroid medication was discontinued and within ten days there was a return of all the mental symptoms. Thyroid extract was again given in smaller doses and carefully supervised. By February 10, 1938, Mrs. E. was free from crying spells, she was doing all of her own housework, her weight was 155 pounds, pulse 88, and basal metabolic rate +15 per cent. I last saw the patient on April 12, 1938, at which time she reported that she thought that she was cured.

* * *

*Case 3.*—Miss M. G., a clerk, aged forty-nine, consulted me in April, 1935, stating that she had been chronically depressed for six years. Her trouble began following a middle ear infection which she wrongly believed would result in mastoiditis, meningitis and death. At that time her preoccupation with the ear condition amounted almost to a somatic delusion. She was referred to an internist who gave her digitalis and placed her under supervision. A few months later the internist referred her to a neurologist who attempted a modified psychoanalysis. The patient was hospitalized for fourteen weeks and daily interviews were held with her in an effort to explain her fears and phobias on the

basis of a sex repression. The woman being a frigid virgin and a very religious person besides, reacted to that form of psychiatric investigation in a very unsatisfactory manner. She became more and more depressed, developed ideas of self-accusation, and was convinced more than ever before that she was kind of a sexual pervert. When I saw her she was very much discouraged. She cried a great deal, had ideas of suicide, was unable to take any interest in her usual activities, slept very poorly at night, and her self depreciation was intense. Her ideas concerning fancied sexual perversion were very vague, poorly defined and unsystematized; but they formed a prominent part of the psychiatric picture. Although she weighed 210 pounds, and complained of easy fatiguability, I did not think of the possibility of hypothyroidism until the fall of 1936. At that time Miss G. began to complain that her hair was falling out, and she had missed two menstrual periods. Her psychiatric status was very much the same as it was at the time I first saw her. A basal metabolic rate determination was made and found to be —16 per cent. The gastric contents did not contain any free HCl; Hb. was 74 per cent; R.B.C. 3,940,000; and urinalysis negative. The patient was given dilute HCl and 2 grains of desiccated thyroid gland daily. She failed to lose weight or to notice improvement in her mental condition until she reached a maintenance dose of 5 grains daily. She is now taking this amount. Her weight is 185 pounds; Hb. 82 per cent; R.B.C. 4,500,000; urine, normal; menses, regular. Mentally she is very well. She occupies a responsible position, and in addition to that is meeting a very distressing home situation very adequately.

## Comment

One must admit that in the cases reported above, hypothyroidism was not proven to be the cause of the psychiatric deviation. Ravin[4] states that when we speak of an individual as having myxedema we refer to the entire syndrome—slow mentality, dry skin, non-pitting edema, elevated blood cholesterol, etc., and not to the single feature of myxedematous infiltration of the tissues. He believes that since decrease or absence of thyroid secretion results in a state of myxedema in all of its features, we must consider myxedema as a manifestation of diminished thyroid secretion. Myxedema and hypothyroidism imply more than hypometabolism, and the terms should not be used in the absence of other evidences of diminished thyroid function, says Ravin. On the other hand, Hensel,[1] and Mason et al.[3] agree that it is possible to have true hypothyroidism without myxedema. In fact, Mason believes that the blood cholesterol is a more reliable indicator of hypo- or hyperthyroidism than the basal metabolic rate.

Whether or not the mental symptoms in the above cases were due to hypothyroidism or to hypometabolism from any other cause, increasing the metabolic rate by the feeding of desiccated thyroid did normalize the emotional reactions when other forms of treatment failed. It might be said that increasing the metabolic rate enabled the patients to establish compensation at the psychologic level and thus to meet their life situations in a more efficient manner. Bearing in mind the psychobiologic equation "Individual plus Situation equals Reaction" we might say that in some people the reaction of the individual without thyroid to a life "Situation" is one of mild melancholia. Just as in myxedamatous patients the electrocardiographic voltage is increased by the administration of thyroid gland, there evidently are other individuals whom increase in their "psychic voltage" helps to meet life situations. Without thyroid stimulation these people are inadequate, and they fail to compensate at the psychologic level. Stimulated by the administration of thyroid medication they find themselves able to react normally and adequately, and the resultant emotional tone is one that is not painful or distressing. It must be remembered that these people are not myxedematous and their basal metabolic rates are not reduced to any considerable degree. In this respect the clinical picture just described differs from that of the true myxedematous psychoses, and for this reason its cause is more liable to be overlooked.

## Summary

Certain women in the 5th decade of life who are overweight and who have slightly reduced basal metabolic rates suffer from a form of chronic nervous depression which is relieved by the administration of desiccated thyroid.

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## Discussion

DR. L. R. GOWAN, Duluth: I am sure we are all grateful to Dr. Kamman for presenting this series of cases, pointing out the psychic manifestations that one occasionally sees in a patient presenting glandular imbalance in which the thyroid may be the offending

member. With our increasing insight into the importance of the consideration of each individual patient from a psychosomatic viewpoint, it becomes more and more apparent that psychiatric pictures are frequently due to physiological imbalance, as well as the fact that practically all somatic disease has a psychic component which plays a large part in determining its eventual outcome.

With particular reference to the cases cited, the question arises as to what result might have been obtained if these patients had been treated from the standpoint of pituitary dysfunction primarily, and thyroid secondarily. Dr. Kamman did not state whether any one of these patients had been treated from the standpoint of ovarian dysfunction, although they were all within menopausal age limits.

The average physician confronted by a woman in the forties presenting nervousness, characterized chiefly by depression, usually thinks of the possibilities of glandular imbalance, in which, of course, the thyroid is frequently involved. In the absence of objective signs of organic disease it is not enough to tell the patient that she is "just nervous and to go home and forget about it." Whether the reason is organic or emotional, there *is* a reason for every evidence of emotional disturbance which can be discovered in a very high percentage of cases, if sufficient time and painstaking search is made. When one realizes that at least 40 per cent of all patients have no physical disturbances, but have complaints based on emotional imbalance, it is apparent that the greatest deficiency in American medicine today is the neglect and misunderstanding on the part of the average physician of the importance of emotional balance, not only in preventing signs of nervousness, but also preventing the inception of organic disease and aiding its ultimate cure.

The lessons that we have learned from Dr. Kamman's presentation are so evident that they need no elaboration from me. However, I should feel that I were neglecting a wonderful opportunity if I did not stress to this group the importance of the mental hygiene approach to every patient in all branches of medicine. In doing this, allow me to refer to the work of Dunbar and her collaborators in New York which has been carried on over a period of eight years, under the title of "The Psychic Components of the Disease Process," the first report of which was presented at the annual meeting of the American Psychiatric Association in St. Louis in 1936 and the second report presented on June 7 of this year at the meeting of the American Psychiatric Association at San Francisco. These workers have studied the importance of the Psychic Component of the Disease Process in some 1,400 patients.

With your permission, let me read the conclusions of their first paper:

"1. Much of present-day medical treatment of somatic ailments is purely palliative and symptomatic in the sense that many somatic ailments (as well as many manifestations in the physical sphere which used to be considered organic disease entities) are merely symptoms of an underlying disease process developing in psychic and somatic aspects. This is borne out by our findings in the groups of patients reported.

"2. The psychic component may be determinative in illness, no matter how 'organic' this illness may appear to be, with the qualification that from the point of view of therapy as opposed to palliation, it is more significant in illnesses or phases of illnesses where the pathological changes are still reversible.

"3. From the point of view of the hastening of convalescence and the guarding against relapse, the rôle played by the psychic factor is determinative in a considerable proportion of patients (as reported here for patients with cardiovascular disease, diabetes, and fractures) although its exact nature and extent should be investigated further.

"4. It is probable that the psychic factor is specific, at least for certain disease processes or syndrome, such, for example, as "essential hypertension."

I realize that I have digressed considerably from the discussion of the paper just presented. However, I feel keenly about the need for the psychosomatic understanding of disease and I wished to grasp this opportunity to emphasize it.

Again I thank Dr. Kamman for his presentation.

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## FRACTURE OF THE ELBOW AND VOLKMANN'S ISCHEMIC CONTRACTURE*

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THE prevention of the disabling and disfiguring complication, which is seen most commonly among children, following fracture of the elbow, and which is known as "Volkmann-Lesser paralysis," "Volkmann's ischemic paralysis," "Volkmann's myositis" or "Volkmann's contracture," is of interest to every practicing physician. Although it may occur in cases in which the fracture has not been treated by a physician or by any form of fixation, there appears to be a belief that negligence and unskilled management on the part of those who are in charge of the treatment is the cause of this condition. This is the basis on which malpractice suits are founded. Since the time Volkmann first described the condition in 1869, various theories have been advanced as to its etiology and there have been different opinions as to the methods most efficacious in its treatment. I believe that the factors involved in its causation are now understood. The physician who carefully observes, and has the coöperation of his patient, who is cognizant of the early symptoms, and who carries out measures to prevent interference with the circulation of the forearm, may avoid the occurrence of this contracture. The general practitioner sees the majority of these patients first and it is his responsibility to see that the delicate soft tissues are not allowed to become irreparably injured as a result

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of intrinsic or extrinsic pressure. A record of the findings at the time of the first visit of the patient should be made. This record should include the interval between the injury and examination, as this has often an important bearing on the extent of swelling and cyanosis. The character of the pulse and presence of paralysis may determine the type of treatment. In those cases in which the physician finds serious impairment of circulation, he should request a consultation to protect himself and to give his patient the benefit of possible added skill in meeting the impending complication. The patient's family appreciates the gravity of the situation more than does the patient. The concern of the family, when consultation is obtained, results in a better understanding of the situation and lessens the likelihood of medico-legal entanglements should the result be unfortunate.

Prompt and skillful treatment of fractures about the elbow in cases in which there has been no serious injury to blood vessels or nerves usually produces excellent results unless infection as a result of the primary injury or surgical treatment complicates the picture. What are the factors, then, which are present and which produce the ischemic contracture? The common fracture associated with this contracture is of the supracondylar type, in which the force that breaks off the lower fragment of the humerus carries the condyles backward and strips the periosteum away from the posterior surface of the humerus. The space thus formed promptly becomes filled with blood. The lower fragment is carried forward, pierces the periosteum, and may impinge on or cut blood vessels or nerves in its further downward course. The blood which forms about the site of the fracture infiltrates the antecubital spaces, compresses the soft tissues, and if there is a large amount of blood it may pass downward into the forearm. Should there be a ruptured artery, this intrinsic pressure alone may be sufficient to cause serious interference with circulation, which is of such magnitude as to produce an ischemic contracture. In cases in which improper transportation produces repeated movement of the fractured parts, further swelling and hemorrhage result and there is the possibility of laceration of previously impaired nerves, blood vessels and soft tissues. The thin walled veins are the first to become compressed and the return circulation is impaired or is completely cut off. The muscle spasm holds the bones in an overlapped position, which adds to the pressure, and the proximal fragment may impinge on the vessels and cause further injury. If no treatment is carried out, this fracture may result in malunion with, or without impairment of movement, or ischemic contracture. Should arterial hemorrhage continue, the subfascial hematoma produces distention, extreme pain, and tenderness at the antecubital space, and cyanosis, loss of pulse and numbness. The hemorrhage into the forearm is confined by the interosseus membrane, radius, ulna and the inelastic aponeurosis of the flexor muscles. The forearm, hand and fingers become cold, wet, pulseless and cyanotic and blebs appear. Pain is very severe, and unless intrinsic pressure is relieved, contracture occurs. It is a matter of hours, not days or weeks, before muscle tissue is injured, and the patient, as a result of unavoidable circumstances, may not have seen a physician or may not have had any form of treatment whatever. Should the patient arrive in such condition, expecting the fracture to be reduced and his arm put in a splint so that he may return home, an immediate consultation and hospitalization should be demanded, and a record should be made and witnessed for the protection of the physician.

Unfortunately, the general practitioner is forced to travel considerable distances daily and as a result is compelled to depend on others who often are unskilled to carry out his instructions. He may reduce a fractured elbow satisfactorily and leave his patient comfortable and free of pain, only to find on his return that swelling has occurred and serious injury has resulted. In some instances he will find that the fragments have slipped and unless he checks the reduction by roentgenographic examination he will be confronted with malunion. In 40 per cent of a series of cases of Volkmann's ischemic contracture, which was associated with supracondylar fractures, the fractures were malunited. Usually, the distal fragment was found malunited in a posterior position; occasionally, lateral displacement results in loss of carrying angle. The value of anteroposterior and lateral roentgenograms, which are made before and after reduction of the fracture, cannot be overemphasized. Under ideal hospitalization and nursing care, the physician has more protection against undue swelling and its disastrous results than he has otherwise.

Nurses and assistants should be instructed, however, to look for symptoms of impaired circulation.

In cases in which the swelling is sufficient to make reduction difficult and in cases in which immobilization in flexion with splints or casts results in pain, it is advisable to remove constricting dressings, place the patient in the recumbent position and elevate the arm. Should pain and swelling increase sufficiently to cause cyanosis or interference with the circulation, it is advisable to abandon the treatment of the fracture and care for the soft tissues. Of what use is treatment which results in good position of the bony parts at the expense of the function of the extremity? A properly reduced fracture that is held in position by retentive splints should not require opiates for relief of pain. Suspension of the arm above the recumbent body for a few days usually will permit reduction of the fracture after swelling subsides, without risk of incurring excessive pain or ischemic contracture.

When patients are ambulatory, the airplane splint is excellent and aids in the prevention of edema. Why so many patients are permitted to be up and about with arms swollen and cyanotic and hanging at their sides is difficult to understand.

A third group of patients are seen after the antecubital space is distended and tender and the pulse is faint; the skin has then assumed a bluish-red color and pain is unbearable, opiates having often been freely administered. If splints, bandages, adhesive tape, or casts have been applied, they should be removed and the arm should be elevated on pillows, with the elbow extended beyond a right angle. Warm, but not hot, moist dressings should then be applied. If within the next hour the swelling increases and the pulse is absent, the relatives must be warned as to the seriousness of the situation and preparations should be made to operate. Intrinsic pressure has in such cases become sufficient to block the venous flow, but the stronger-walled artery still permits a little blood to be forced into the arm. In the cases of older patients with impaired blood vessels and feeble hearts gangrene is possible, but in children the stage is set for ischemic contracture.

A fourth group of patients is encountered after several manipulations have been performed and considerable time has intervened since the fracture. The arm is then distended to such an extent as to demand immediate relief through surgical measures. There is no time to be lost, as degenerative changes may not be complete and viable tissue may yet be saved. It is at times impossible to judge accurately as to the amount of damage done to the nerves and blood vessels, for the circulation is no longer active and, with its loss, the nerve supply becomes numbed and the finer distinctions of sensation and motion are lost. Relatives should be advised and operation resorted to in the hope of preserving the function of the forearm, treatment of the fracture being of secondary importance. Skeletal traction, by means of a Kirschner wire through the olecranon, is an excellent method of correcting malposition of the fragments and should not in certain cases be overlooked as a useful aid, either as a preliminary to exploration of the hematoma or after careful operative inspection of the brachial artery and median nerve. Free incision over the hematoma and through the deep fascia liberates muscle tissue and blood which have been under tension. An incision mesial to the biceps permits the bicipital fascia to be divided close to the tendon, and the artery, vein, and nerve can readily be inspected. Complete rupture of the brachial artery has been observed as well as partial or complete severance of the nerve. The deep fascia over the forearm may require division, and this may be done subcutaneously by means of a special knife. The fracture may be reduced and internal fixation used by means of bone screws or Kirschner wire which may be passed up through the condyles into the proximal fragment. The entire arm is then enclosed in a large, moist alcohol and boric acid dressing and is suspended in abduction. The physician who has mastered the preventive measures described is in a position to meet the complications following supracondylar fractures in children and to prevent many of the disastrous complications of ischemic contracture.

### Conservative Treatment of Volkmann's Ischemic Contracture

Volkmann's ischemic contracture may occur in a few hours, and the earlier treatment is begun the better the results will be. The consultant is often called after the contracture has been present for some time, and he finds the wrist flexed, the metacarpophalangeal joints extended, and the phalanges acutely flexed. Motion at the elbow is often restricted and the hand is held in prona-

tion; supination may be impossible and numbness of the forearm exists. As the damage to the soft tissues may be benefited by release of intrinsic pressure, a consideration of the methods previously described should be given. No time should be lost in attempting gradual extension of the involved muscles, and the stretching method of the late Sir Robert Jones is generally recognized as excellent.

While the wrist is acutely flexed, it will be found that the fingers can be extended. Metallic splints are then fitted to each finger to maintain the corrected position. The patient now attempts systematically to extend the metacarpophalangeal joints, which are contracted. In a few days the joints stretch sufficiently to allow the application of longer splints, which extend to the wrist. After the wrist is exercised for a few days the splint is extended to the elbow, and among such splints can be used those which maintain extension of the hand. Thus the contracture is gradually and painlessly overcome.

I have found many splints in use, but prefer the simple and inexpensive wooden tongue-depressors found in every physician's office. With these padded and held by strips of adhesive tape, the principles of Jones may be carried out until stretching of the wrist requires longer splints, which are usually made of a thin piece of boxwood. The use of rubber bands to pull the extended hand toward the longer splint is useful in extending the wrist. The banjo-splint, used with rubber bands fastened to adhesive on the fingers permits the fingers to be exercised at all times and is most efficient; it is inexpensive, can be made in a few minutes, and permits the patient to be cared for at home.

Care must be taken to gain the confidence of these children, and after a short time they will become interested and will coöperate exceedingly well. Thus the first few treatments may consist of heat and whirlpool baths combined with light massage. The splints soon may be adjusted and worn during the intervals between treatments. Active motion is performed willingly, and as confidence is gained active motion may be supported by gentle passive motion and electrical stimulation. We at the clinic rely principally on heat and massage as aids to gradual stretching and do not believe that painful, passive motion or forceful manipulation under anesthesia is advisable.

The next stage in the treatment of Volkmann's ischemic contracture is that in which several months have elapsed since fracture, during which time treatment has been inadequate. The pain and swelling are gone and the hand is sensitive to cold and has the typical claw-like position; motion is limited. Usually the hand is held in pronation and there is limitation of motion in the elbow. Ulceration and scars from pressure of splints and bandages are not infrequent. Paralysis from primary injury, or secondary to scar formation, may involve one or more of the main nerve trunks. The radial pulse may be absent, and the arm and hand have lost the cyanotic appearance and are white. Attempts to straighten the fingers with the wrist extended brings out the tight flexor tendons and the hard atrophied flexor muscles; the finger nails cut into the hand of the examiner. The extensor group of muscles are, on the other hand, preserved or only slightly involved. There may be atrophy of bone, myositis ossificans, and roentgenograms may disclose malposition of the fracture, requiring correction. All forms of treatment now prove less satisfactory, and prolonged and adequate conservative treatment is best. First the Jones, or banjo-splint, method of extension, combined with physiotherapy, should be tried. When this has failed, the next stage is reached and surgery may now render the contracture more responsive to conservative treatment.

In the third stage a group of deformities of longer duration are encountered, years often having passed with the contracture persisting in spite of treatment. Marked contracture, atrophy of bone, scars, contracted capsules, nerve degeneration and impaired circulation, and a rope-like musculature challenge the most expert surgical care. The surgeon must now realize that no matter what type of operation is performed nor how skillfully it is done, he cannot bring about complete cure; when all other means have failed he is the only recourse, and he plans the operation in the hope of bringing about an improved cosmetic result and some return of function. If the flexor muscles are entirely fibrous the prognosis is poor. The surgeon should also remember that without careful postoperative care and prolonged and intelligent physiotherapy he can accomplish little.

Through lengthening of tendons the surgeon is able to obtain extension of the fingers and

wrist, the extent and benefit of this procedure depending on the damage done. A longitudinal incision parallel to the palmaris longus muscle is made and the vagina fascia is divided, exposing the muscle and tendon. By retracting the fascia, the superficial group of muscles are exposed and the tendons lengthened by making two oblique sections, 2.5 cm. apart, three-fourths of the distance across the tendons and stretching them by means of a forceps passed underneath. The usual muscles lengthened are the palmaris longus, flexor carpi radialis, flexor pollicis longus, and flexor digitorum profundus. In some instances the surgeon will find the median nerve bound down in a fibrous scar and neurolysis will be advisable; also, the tendency to supination in the more resistant cases may be benefited by section of the pronator quadratus or the pronator teres.

I have observed a considerable difference in the amount of fibrous scar tissue and fixation of the structures about the wrist. In some cases it is possible to leave the tendons in their sheaths during operation, and a minimum of retraction, and scarring, and adhesions result. When lengthening of the flexor pollicis longus and flexor digitorum profundus is performed, considerable more trauma is likely to result, binding the entire mass in scar tissue. With care this operation may be carried out with distinct satisfaction to the patient; it allows correction of the deformity and improved function.

Neurolysis is beneficial, especially when pressure sores are obvious and scars cause contracture and fixation of the nerve. The findings at operation frequently lead the surgeon to conclude that the entire ischemic contracture is the result of injury to, and fixation and degeneration of, nerves. I feel that the changes in the nerves are usually secondary to the ischemia unless a primary injury or rupture occurs at the time of accident or manipulation. I have seen complete rupture of the median nerve following supracondylar fracture and ischemic contracture. In this series of cases the radial nerve was most commonly injured.

Resection of bone is resorted to in long-standing cases of contracture in which the tendons are extremely short and all attempts at conservative treatment have failed. A bone graft may be used to bridge and maintain the wrist in extension. The stretching of nerves and blood vessels after years of contracture, during which time the bone has grown and the tendons have remained as they were, is impractical. I cannot agree with some who condemn this operative procedure of removal of bone. There is a group of older patients with long-standing deformity in which resection of the carpal bones or radius and ulna gives excellent cosmetic results and a measure of functional benefit.

Lowering of the common origin of the flexors at the epicondyle is an operation which partially releases contracture and is used in combination with gradual stretching. It may be performed at the same time the median and ulnar nerves are examined.

When the proximal end of the humerus projects forward in malunion, preventing flexion of the elbow, or excessive callus formation or an ossifying hematoma exists, excision of the bony mass may be of benefit. Often there is contracture of the capsule of the elbow that will require capsulotomy. The biceps tendon may require lengthening as a result of involvement of the muscle from ischemia or long contracture. Even arthroplasty of the elbow would be preferable should the foregoing measures fail to permit movement and the function of the arm be not too seriously damaged. Sympathectomy has not as yet had a fair trial, but in one case it seemed to be of some aid.

Several patients have been encountered who had such extensive and long-standing deformity and disability as to warrant amputation, in order to rid them of a useless and unsightly deformity.

The prognosis depends on many factors: the age of the patient, the type of bandages, splints, and casts used and whether they have caused pressure sores and scars, the extent of hemorrhage, and whether good union or malunion was obtained, whether infection was present or there was damage to blood vessels or nerves, the presence of an ossifying hematoma, and degree of contracture and extent of fibrosis of muscle.

# PRACTICAL POINTS IN ANESTHESIA*

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THE subject for this paper was selected by the program committee and accepted by the writer. It does not attempt to present anything new or striking but rather to emphasize certain useful facts and procedures which are helpful in obtaining good sedation, pain relief, and operative facility with safety.

About twelve years ago a man came into my office, said he was a morphine addict and very much needed some morphine relief. I called the federal narcotic office, checked his identity, and obtained permission to administer some morphine. When I had prepared it the man said, "May I please give it myself?" He threw his handerchief around his arm, held it with his teeth, tightened his fist, adroitly inserted the needle into a vein in his forearm and sighed with relief as he pressed the piston home. When I told this to a doctor friend, he said he had had the same experience some time before and since then had always given morphine intravenously for relief of acute pain. I too have always done so since and so have many others. If the drug is dissolved in at least 2 c.c. and injected slowly, the pain will be relieved as soon as an adequate amount has been injected whether that amount is 1/12 grain or ½ grain. One is protected against giving an overdose or giving an inadequate dose and waiting fifteen to thirty minutes to know whether relief is to be obtained. The patient has the benefit of immediate relief. Morphine preparatory to a painful examination, manipulation or dressing, or before an emergency general anesthetic, may also often be best given intravenously. Sometimes when local anesthesia has been selected as the anesthesia of choice but the patient has had insufficient sedation, is afraid, excited, and unduly sensitive to the discomfort of the needle, this method of giving morphine is the best possible treatment. In all these latter circumstances, without the relief of pain to guide the dose, the injection must be made slowly and stopped as soon as any of the following symptoms appear: dizziness, weakness, sleepiness; or tingling, numbness, or aching in any part of the body. If the injection is made too rapidly, twitching or even convulsions may ensue. As soon as the proper dose has been given, the patient is at ease mentally and physically and unconcerned about the painful examination, dressing, manipulation, or injection of local anesthetic.

If real anesthesia is needed for some still more painful but presumably short procedure, one of the short acting barbiturates is available for intravenous use and represents one of the greatest advances in anesthesia. Evipal and pentothal sodium should be used in 5 per cent solution. About 1 c.c. should be injected each 10 seconds until the patient is unconscious and then 0.5 to 1 c.c. intermittently as required to maintain the desired level of anesthesia.

Support of the jaw and maintenance of an open airway is absolutely essential. Lundy's "butterfly," a wisp of cotton or slip of tissue attached by adhesive before the nostrils and lips, is a simple and helpful device and should always be used. The respiration tends to be so quiet and shallow that it is otherwise difficult to be sure that it is not being obstructed. Adequate relaxation for reduction of a fracture may be obtained immediately, but continuance of good relaxation, for any purpose, is unsafe because of the danger of respiratory-center paralysis. High concentration of the drug in all body tissues is produced, and recovery from a slight excess is no longer prompt.

One should never be tempted to use the intravenous barbiturates for procedures within the mouth and pharynx or even in the nose and antra. Muscles of the jaws and of the throat are not well relaxed by these agents without closely approaching paralysis of the respiratory center, and spasms of jaw, tongue, pharynx, and larynx are easily set up by any attempted manipulation, causing respiratory obstruction which is often well-nigh impossible to correct. A very difficult and dangerous situation develops in a high percentage of attempts to do such work

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under such anesthesia. If obstruction occurs, respiratory effort almost immediately ceases.

Although the patient will awaken in a few minutes after the injection is discontinued at the end of a normal anesthesia, it must be remembered that coördination and judgment may not return to normal for perhaps an hour or sometimes two or three hours, especially if the anesthesia has been at all prolonged. If the patient must leave, he must leave as a patient, with a competent person to take care of him.

In the field of local anesthesia several special points are worth bringing up in such a discussion as this. One of the commonest uses of local anesthesia in office practice is for the removal of sebaceous cysts. The injection method of Dr. F. Z. Havens of Rochester is the simplest and most practical. The point of the fine small wheal needle is inserted into the skin over the center of the cyst. An intradermal wheal of 1 per cent procaine is started which is of course just outside of the sac of the cyst. Without changing the position of the needle at all the injection is continued until five, ten, or even fifteen c.c. have been injected. The wheal spreads out and the fluid spreads around the sac in all directions, dissecting it from the outer layers of the skin. The anesthetic solution follows the line of cleavage and tends to dissect out the entire sac, even though it may be a large one, so that when a shallow incision is made down to the surface of the sac, it delivers itself with almost no additional aid. If the cyst has been inflamed and has become adherent, it may be necessary to take out some surrounding fat in addition to the sac. It is then best to do a field block, surrounding the cyst with a linear subcutaneous injection introduced through two opposite skin wheals and then through one of these wheals a needle is inserted underneath the cyst and it is "teed up" by a deposit of 10 c.c. or more. The field is anesthetized in this same latter way for the removal of a lipoma. This method is much more satisfactory than injecting the line of incision and then indiscriminately infiltrating all tissues before entering them. The same is true of anesthetizing the abdominal wall. The lower intercostal nerves run diagonally forward and downward between the transversalis and internal oblique muscles to the rectus sheath, which they enter, and then divide to supply the peritoneum, the muscle, and the skin. If the incision is to be made through the mid-line, or one of the recti muscles, a row of wheals about 2.5 or 3 inches apart is placed from the xyphoid to the outer margin of the rectus, thence downward along the rectus margin. Through each wheal a needle is inserted into the rectus sheath and 10 c.c. of 0.5 per cent procaine is deposited in each place. All of these pools flow together, thus surrounding all the nerves as they enter the sheath. Skin, muscle, and peritoneum are anesthetized and the incision is made through normal, not edematous, tissues. When an anesthetic solution is injected, with the needle remaining in one postion, aspiration must be done frequently to make sure the solution is not being injected into a vessel.

A present day development is the production of anesthesia by the injection of the solution peridurally in the vertebral canal, between the ligamentum flavum and the dura, at any desired vertebral level. Twenty-five to 50 c.c. of 2 per cent procaine are injected, which surrounds the nerve roots as they emerge from the dural sac, and a zone of anesthesia about eight vertebral segments wide is produced. Most of the hazards associated with spinal anesthesia are avoided and the duration is usually longer. It will behoove us to follow the development of this procedure.

Regarding spinal anesthesia, there are some points which can not be too often stressed. It has long been generally recognized that it is unwise to administer spinal anesthesia to a patient whose central nervous system has been subjected to injury or disease such as trauma, new growth, syphilis, poliomyelitis, pernicious anemia, etc. Subnormal neurons are more apt to be unduly or even permanently affected by the anesthetic, or, if they are not, the anesthetic may have to bear the onus of further development of the disease. It is unfortunately not so generally recognized that the nervous tissue is made more vulnerable by any state of depletion of the general health. Undernourishment, loss of weight, anemia, toxemia, and even lack of activity from confinement to the house or bed,—all of these increase the susceptibility to spinal anesthetics as well as general anesthetics. In the presence of these condtions one must decrease the dose and increase the dilution of the spinal anesthetic. Lundy has well demonstrated that 6 per cent, or 7 per cent at the very most,

as the solution leaves the syringe, is the highest concentration which can safely be used, and often it is best to reduce the concentration to 2.5 or 3 per cent.

There is too general a feeling that spinal anesthesia has been a failure, and should not have been used, if it is necessary to supplement it with general anesthesia. I believe this is a wrong conception. Unless general anesthesia is absolutely contraindicated, the only disgrace connected with adding it to spinal anesthesia is in not adding it soon enough. It should be started at the very first indication that the spinal anesthesia is beginning to wane. Then it will be possible to do with a minimum of the general anesthetic. A delay of five minutes will probably double the amount of general anesthetic necessary. One should of course know how to produce as long a spinal anesthesia as may be safely obtained, but in many cases the patient will be best served by administering a very conservative dose of spinal anesthetic and then immediately superimposing unconsciousness by a minimum dose of general anesthetic. The relaxing effectiveness of the small spinal dose will be greatly increased and prolonged and the patient will not be harmed and will likely be the happier for the respite from consciousness.

General inhalation anesthesia in its present stage of development offers a fascinating field. There is available a variety of gases having various characteristics for varying needs. Fluidity of the gases may be increased by admixture of helium for cases of asthma or other partial obstruction of the tracheo-bronchial tree. Oxygen may be used in varying proportions. Carbon dioxide may be entirely or partially removed, allowed to accumulate or even added, as conditions indicate. Helpful airway devices of the nasal, oral, pharyngeal, intratracheal and even intrabronchial types are available and should be used whenever indicated. It seems to me that in connection with every hospital there might well be a physician who has prepared himself to offer as high a type of anesthesia service as possible. This would be a special boon to hospitals not requiring a sufficient number of anesthesias to warrant the employment of a full-time well-trained nurse anesthetist. If anesthesia is to be only a part-time activity, it certainly can be best done by a physician. I do not mean a physician who regards it as a makeshift, or as an undesired stepchild, or as a personal right, regardless of his lack of skill, simply because he has brought the patient in. I mean one of the community's physicians who is keen in other things, who sees in anesthesia an opportunity for expression of a high type of medical skill, and who will take as much interest and pride in bringing to the community's surgical patients the best obtainable in anesthesia as he does in the diagnosis and treatment of disease in general.

## Discussion

DR. EDWARD B. TUOHY, Rochester: Morphine given intravenously has a definite place in the field of anesthesia as an auxiliary drug to produce a sedative effect or relieve pain. Its intravenous use also permits the patient to retain full consciousness and thus to cooperate with the operator.

Recently I have acquired, from one of the commercial drug firms, a preparation of morphine sulfate (¼ grain, 0.016 gm.) in 1 c.c. ampules. To increase the ease with which morphine may be administered was the incentive for preparing morphine in ampules. It is my impression from a limited number of cases that the strength of the morphine sulfate prepared in ampules is definitely greater than that prepared by the usual method from tablets. I have found that, whereas ⅛ grain (0.005 gm.) of morphine sulfate was the usual or average amount necessary to produce subjective effects when the solution was prepared from tablets of 1/6 grain (0.01 gm.), definite subjective symptoms, such as sense of warmth over the body, itching of the nose, and so forth, now are obtained from as little as 1/64 grain (0.001 gm.) when the ampule preparation is used. One can dilute the contents of a 1 c.c. ampule containing ¼ grain (0.016 gm.) of morphine sulfate with 2 to 3 c.c. of distilled water and thus administer a small dose with accuracy and safety.

The intravenous use of morphine for bronchoscopy has proved to be helpful and serves to reduce the nervous tension which many of the patients exhibit prior to bronchoscopic examination. The disadvantage of using the barbiturates for analgesia by the intravenous method for this procedure is that in some cases sufficient relaxation of the jaws is not obtained and the introduction of the bronchoscope is difficult. It is unwise to attempt to increase the depth of anesthesia by injecting intravenously more of a barbiturate, such as pentothal sodium, in such a case, because of the danger of depressing the respiratory center. In most instances, furthermore, the pharyngeal reflexes are somewhat exaggerated during intravenous anesthesia. In selected cases when intravenous anesthesia seems to be indicated for bronchoscopy, it is recommended that the throat be anesthetized by topical applications of 10 to 20 per cent solution of cocaine on cotton pledgets, and that sufficient depth of anesthesia be induced by intravenous injection of pentothal sodium so that the patient does not respond to definite sensory stimuli, such as pinching of the skin. At this depth of anesthesia the jaws should be relaxed reasonably and the bronchoscope can be introduced satisfactorily. The previous anesthetization of the throat by means of cocaine will serve to reduce the activity of the pharyngeal reflexes.

In this connection it may be of interest to mention the use of avertin fluid (tribromethanol and amylene hydrate) for bronchoscopy and for diagnostic ventriculography and encephalography of children. The basal metabolic rate of children usually is between

+20 and +40 per cent, and for the most part, children less than ten years of age tolerate well, larger doses of avertin fluid per kilogram of body weight than adults. The explanation of this phenomenon is that the increased metabolism of children serves to break down and destroy the avertin fluid faster than the lower basal metabolic rate of adults. Therefore, for bronchoscopy and encephalography in children, one can administer between 90 and 100 mg. of avertin fluid per kilogram of body weight. In the presence of pulmonary disease of children, such as pulmonary abscess or bronchiectasis, the use of avertin fluid as an anesthetic for bronchoscopic examination is fairly satisfactory. The relaxation afforded by avertin fluid is more than that produced by the intravenous administration of barbiturates and I believe that it is a safer anesthetic than pentothal sodium to administer to children. This barbiturate administered intravenously to children seems to depress the respiratory center too severely and for this reason it is not recommended except in unusual cases.

The production of adequate surgical relaxation of the upper part of the abdomen by means of spinal anesthesia is a problem which presents many angles. The fall in systolic blood pressure and the nausea attendant on high spinal anesthesia are the two annoying and disagreeable features of this procedure. In relatively tall patients satisfactory anesthesia of the upper part of the abdomen may be sustained by utilizing as sites of injection the upper lumbar interspaces and if necessary, the space between the twelfth dorsal and the first lumbar vertebræ. By using these higher interspaces in other cases one may obtain anesthesia of this region without materially increasing the dose of the anesthetic. When metycaine or procaine is employed for spinal anesthesia for operations on the upper part of the abdomen, the interspace between the first and second lumbar vertebræ usually is used. The dose of the anesthetic will depend on the weight, height, the concentration of hemoglobin, blood pressure and general physical status of the patient. Ordinarily, for upper abdominal operations at least 3.5 to 4 c.c. of cerebrospinal fluid should be aspirated into the syringe which contains the solution of the anesthetic before reinjecting the combined contents into the subarachnoid space. Frequently when satisfactory anesthesia has been obtained for opening the abdomen, the manual manipulation of the tissues about the stomach and gallbladder is disturbing to the patient and surgeon and not infrequently induces nausea and subsequently vomiting. In other cases nausea and vomiting ensue shortly after completion of the injection into the subarachnoid space and considerable muscular straining and motion of the abdominal wall are present.

Often the judicious administration of oxygen and carbon dioxide in cases of slight nausea will serve to control the symptoms, and those patients who are upset emotionally in addition to the nausea may be given a little nitrous oxide and oxygen or cyclopropane and oxygen in order to produce mild analgesia or very light general anesthesia. If spinal anesthesia does not seem to be satisfactory, it is unwise to force deep surgical inhalation anesthesia immediately, because within fiftten to twenty minutes after the anesthetic has been given, the most profound effect from the spinal anesthesia is usually obtained, and if deep inhalation anesthesia is superimposed on top of spinal anesthesia, it is a tremendous load for the patient's vasomotor and respiratory systems to withstand. It is infinitely safer to induce general anesthesia gradually in order to augment the spinal anesthesia and to bear in mind that approximately twenty minutes after the spinal anesthetic has been given the patient's blood pressure, pulse rate and character of respiration should be watched very carefully. In the majority of cases spinal anesthesia for operations in the middle portion of the abdomen, the pelvis and extremities is uncomplicated and ordinarily satisfactory. Because the quality of spinal anesthesia for operations in the upper part of the abdomen is not always consistently good, one may very well consider use of the intratracheal method of general anesthesia in certain cases, especially for patients who are not considered good candidates for local anesthesia. The merits of this method hardly need further amplifications at this time. The method is mentioned because it is such a useful procedure for different surgical operations in the upper part of the abdomen and on the colon.

Probably two of the biggest advances in anesthesia in the last fifteen years have been the introduction of the intratracheal tube as an adjunct to inhalation anesthesia, and the introduction of the short-acting barbiturates as a means of producing intravenous anesthesia. Pentothal sodium and evipal soluble are the two currently favorite agents for intravenous anesthesia and both are substituted derivatives of barbituric acid. The keynote in their use depends on the slow and intermittent or fractional administration. The degree of surgical relaxation is not the same as that afforded by other methods of anesthesia, but there are many indications for their use, especially for operative procedures which do not require more than thirty minutes. In the last year there have been reports by persons, experienced in the administration of pentothal sodium, on use of this type of anesthesia for various abdominal operations. For patients who are not robust or muscular, pentothal sodium may be used for abdominal operations, but its use should be specially indicated.

The indications and contra-indications have been mentioned previously but it is wise to emphasize the contra-indications again, namely, that children less than twelve years of age usually are not suitable candidates, and that dyspnea of cardiac or pulmonary origin in any case is a warning not to use pentothal sodium intravenously. Its use is contra-indicated also for persons who have taken food recently and have a full stomach.

# HISTORY OF MEDICINE IN RAMSEY COUNTY

BY J. M. ARMSTRONG, M.D.

*(Continued from January issue)*

In 1857, a census was taken in order to determine the Congressional districts preparatory to the admission of Minnesota as a state. The census was begun in September and finished about the end of the year. The list of those claiming to be physicians, dentists, and druggists, together with the age and place of birth of each, is given here. It differs somewhat from the list in the city directory of 1857-58.

**Saint Paul**

| | | | |
|---|---|---|---|
| A. G. Brisbine | 32 | Ohio | Physician |
| J. B. Clemens | 30 | Va. | Physician |
| J. H. Stewart | 29 | N. Y. | Physician |
| L. H. Gabbard | 28 | France | Physician |
| J. M. Smith | 30 | Iowa | Physician |
| M. D. Patterson | 28 | N. Y. | Dentist |
| Thos. J. Vaiden | 45 | Va. | Physician |
| T. R. Potts | 47 | Penn. | Physician |
| C. Miller | 34 | Vermont | Physician |
| D. W. Hand | 23 | N. J. | Physician |
| J. W. Wharton | 25 | Penn. | Physician |
| Libby Dolbur | 35 | N. Y. | Physician |
| Samuel Willey | 28 | Mass. | Physician |
| T. D. Simonton | 27 | Pa. | Dentist |
| J. H. Studifred | 25 | N. Y. | Physician |
| D. C. Price | 29 | N. Y. | Dentist |
| A. Berthier | 34 | France | Physician |
| H. Welsted | 37 | Prussia | Physician |
| Geo. M. Kellogg | 28 | N. Y. | Physician |
| J. N. Schroeder | 30 | Prussia | Physician |
| S. Knapp | 58 | Maine | Physician |
| John Dewey | 35 | N. Y. | Physician |
| J. R. Jenks | 29 | Penn. | Druggist |
| J. T. Hayward | 35 | Delaware | Physician |
| George H. Sperry | 50 | N. Y. | Physician |
| L. C. Kinney | 43 | Ky. | Physician |
| Wm. H. Morton | 28 | N. Y. | Physician |
| John Steele | 48 | Pa. | Physician |
| W. H. Eldridge | 40 | Alabama | Physician |
| W. H. Wolff | 26 | Pa. | Druggist |
| Geo. Hadfield | 43 | England | Physician |
| Chas. P. Carver | 53 | N. Y. | Physician |
| F. R. Smith | 47 | Pa. | Physician |
| D. S. Hutchinson | 30 | Pa. | Physician |
| Francis Rieger | 30 | Prussia | Physician |
| Thomas E. Master | 33 | Md. | Physician |
| A. Berthier | 31 | France | Physician |

**County**

| | | | |
|---|---|---|---|
| R. Post | 57 | Connecticut | Physician |
| A. E. Boyd | 40 | Maine | Physician |

There are names here that appear in no other place, and considering the circumstances of the census perhaps no opportunity was neglected to inscribe every possible name that might be included. It will be noted that A. Berthier is included twice, J. W. Wharton should be A. Wharton, J. H. Studifred should be J. H. Studdiford, Welstad should be Wedelstaedt, S. Knapp should be C. Knapp, C. Miller should be E. Miller, and Thomas E. Master should be Thomas E. Massey. Schroeder, though listed as a physician, was a druggist and opened a drug store in St. Paul in 1858. As to Clemens, Gabbard, Dolbur, Eldridge, and Carver, no other information is available. Perhaps they were drug clerks. Morton's birthplace was North Carolina, and Berthier probably was born in Berthier, Canada. The directory also lists one James Craig, student of medicine, resident at St. Joseph's Hospital.

Several physicians escaped the notice of the census enumerator, for David Day, J. V. Wren, J. A. Vervais, W. H. Miller, Sawyer, Rosenk, and others already mentioned were undoubetedly in St. Paul at that time. J. T. Hayward came from Wilmington, Delaware. He never practiced medicine in Minnesota, but was interested in real estate. He built a number of business blocks and died in St. Paul in 1859.

## 1858

No new physicians seem to have come to St. Paul during this year. The panic of the year before perhaps made St. Paul unattractive as a place to locate. Dr. J. H. Stewart, who had been county physician in 1857, sought the position a second time, but a vote by the Board of County Commissioners on January 6 resulted in the election of Dr. Vervais. The position carried a salary of $800 a year, paid quarterly.

## 1859

The medical happenings of 1859 are as meager as those of 1858. Two new physicians arrived: Wm. Caine, M.D., a homeopath, who inserted his card in the *Pioneer* on January 4, and Dr. Lloyd Dorsey, whose notice appeared on May 11. Nothing further seems to be known about the latter. A Lloyd Dorsey graduated from the University of Maryland in 1821, and a Lloyd Dorsey, Jr., in 1854. He may have been one of these two men. Caine remained here till his death, June 19, 1867.

At a meeting held in August, the trustees of St. Joseph's Hospital decided that "the interests of the hospital would be served by a temporary removal from the hospital buildings to those now occupied by the Academy of the Sisters of St. Joseph." The hospital was too large, for only three or four patients had been received since it opened. Furthermore, the city and county had made other arrangements for city patients. For these reasons the two log buildings on Bench Street, one of which had been the original Chapel of Saint Paul, were again used as a hospital. The arrangements that were made for city and county patients are not definitely known, but since the county commissioners had purchased in February, 1857, sixty acres of land at Pig's Eye (in Sec. 11, T. 28, R. 22, Washington) for a county farm, it may be presumed that the patients were cared for there.

Two physicians died in Saint Paul during the year, Dr. Hayward on May 14, and Dr. C. W. Borup on July 7. In July, Dr. Jno. C. Merrill associated with himself a Dr. W. M. Dunham. Dunham was a nephew of Doctor Boyd; both he and Merrill were homeopaths. Dr. W. E. Braun's name first appears as a res-

ident of Saint Paul in 1859 when he was elected corresponding secretary of the French Canadian Benevolent and Library Association. He remained there several years, then removed to Little Falls. Dr. A. G. Brisbine was appointed a colonel in the State Citizens Soldiery. The exact nature of this office is not known; possibly, the doctor was a member of the Governor's staff.

It might be well, here, to pause in the narrative and review the years previous to 1860, as those years constitute the pioneer years of our history. Sixty physicians of all kinds are reported as having practiced in Saint Paul before the Civil War. Some drifted into other pursuits, but many left for other places as the country opened up and new towns came into being.

The medical problems these men had to face are described in several articles published in the medical periodicals of the day. Those of Wm. W. Finch, and Thomas S. Williamson have already been mentioned. Others include a short note by Dr. J. H. Murphy on Collodion in Mammary Inflammation and Smallpox" (*North Western Medical and Surgical Journal,* Chicago, March, 1851), and the report of Surgeon Geo. F. Turner, of Fort Snelling, in the *New York Journal of Medicine and the Collateral Sciences* for July, 1848 (Vol. 1, New Series, page 21), entitled "An Account of a Severe Form of an Epidemic Miliary Fever which Appeared at Fort Snelling, Upper Mississippi, in the Winter of 1847-48." The disease, no doubt, was scarlet fever. Two paragraphs may be quoted:

". . . of the forty-two cases which have come under my care, thirty-seven have been children under twelve years old (and this number embraces nearly all the children in this immediate vicinity), four were adult females and one male. Six deaths have occurred thus far. . . . It has prevailed epidemically among the Sioux Indians of this vicinity while on their winter hunt, attacking indiscriminately all ages and sexes; but with them, from causes probably connected with their mode of life, it has been comparatively mild. In the memory of the oldest Indians, this epidemic has occurred amongst them twice before, and is peculiar to the cold months in this climate."

Dr. Samuel Willey contributed to the *Cincinnati Lancet and Observer* for April, 1856, a well written clinical observation on a case of gangrene of the right lung.

There is also a paper by the Rev. Samuel W. Pond, an early missionary, to be found in Volume XII of Collections of the Minnesota Historical Society entitled, "The Dakotas or Sioux in Minnesota as they were in 1834," giving considerable information as to the diseases of the Indians. He states that insanity and idiocy were rare. A very valuable paper by Dr. David Day dated Winnebago Agency, July 5, 1852, on the diseases of the Indians (Report of the Surgeon General, U. S. Army, in Senate Documents, 1st session 34th Congress, Vol. 18, 1855-56) and other reports from medical officers stationed in Minnesota, may, of course, be found in the Surgeon General's Reports.

A survey of the articles by Finch, Williamson, and Pond reveals that the diseases prevalent in Minnesota at this period differed but little from those prevalent today, except that typhoid fever and intestinal affections have almost disappeared due to the construction of sewers, an uncontaminated water supply, and improvement in the feeding of infants. Cholera, of course has disappeared. Pneumonia was perhaps much more common then, due to the discomforts of the inadequate housing and heating of those days. Most of the old settlers kept warm by wearing buckskin underwear. Scurvy has practically disappeared and probably never will appear again. Perhaps many of the cases denominated scurvy in those days we should now call pellagra. In the early days, when navigation closed on the river there was practically no communication with the outer world as far as the securing of provisions was concerned. In the early fifties, a stage line ran to Galena,

where there was a rail connection with Chicago, but little freight could be moved in this way. The late Mrs. Robert P. Lewis stated that she received from her father a present of a gold dollar for Christmas, 1849, and was told that she could buy for herself anything she wished with it. After much deliberation she purchased two eggs to eat on New Year's. The late Mrs. T. C. Schell said that in the winter of 1852 she had a severe cold and expressed the desire for a hot lemonade. Her husband (she was then Mrs. Charles H. Oakes) scoured the town and finally succeeded in purchasing the last lemon in the place, for which he paid fifty cents. Fresh food was so scarce and whiskey so cheap that it is no wonder that deficiency diseases as well as gastric disorders were much in evidence. Protein diet consisted largely of salt pork, although game was abundant, and venison and bear meat offered some variety during the winter. Williamson mentions typhomalaria, a term used indiscriminately in those days, and even much later, for many types of fever and intestinal febrile disorders. It is doubtful if the true malaria was endemic in Saint Paul. No doubt cases were imported by way of the river boats from the south, and during some years it was quite prevalent along the river. Cholera, of course, was imported in this way. Smallpox and measles were common enough. Tuberculosis was comparatively common, inasmuch as many people came to Minnesota to enjoy the advantages of the climate as a cure for that affection. Perhaps it was no more common than in other parts of the country at that time. In the early days our population was made up of the young, the sturdy, and the adventurous, and in the later years of the period housing conditions were better and compared favorably with housing conditions in other parts of the country. Though considered good at that time, living under the same conditions would be considered decidedly unbearable today.

Daniel Drake, in his great work "The Principal Diseases of the Interior Valleys of North America" (1854), says nothing about malaria here, and Ramsey in his inaugural address to the legislature in 1858 denies its existence in Minnesota. As to the treatment of disease employed by our early physicians, one cannot go into great detail. The best of these men were well qualified and compared favorably in the quality of their work with those elsewhere. There are in the Ramsey County Medical Library many books bearing the autographs of our pioneer physicians. Among those published before 1860, which were used for reference, the following may be listed:

Surgery—Dorsey, Gibson, Smith, Druitt, Pancoast, Bell, Cooper, and Miller.
Obstetrics—Dewees, Meigs, Hodge.
Therapeutics—Chapman, Eberle.
Gynecology—Dewees, Eberle.
Pediatrics—Dewees.
Medicine—Thomas, Chapman, Good.
Chemistry—Webster, Henry, Hare.
Anatomy—Horner, Wistar, Bell, Smith, Horner's Atlas.

Other books, Beaumont, Rush's works, some of Holmes' essays, Buchan's "Domestic Medicine," some works on insanity belonging to Willey, and several on venereal disease and dermatology are deserving of mention.

It will be noted that most of these books are by Pennsylvanians. There are several reasons for this, as most of our early physicians came from Pennsylvania or from the West where the Pennsylvania influence was dominant. This applies particularly to Saint Paul. No doubt the fact that Governor Ramsey was a Pennsylvanian attracted many from his former home. Those who came from New York or New England left no books which have come to us. The

*American Journal of the Medical Sciences,* the *Chicago Medical Examiner,* the *Ohio Medical and Surgical Journal,* the *Boston Medical and Surgical Journal,* the *Transactions of the American Medical Association,* various Cincinnati journals and the *Buffalo Medical Journal* were periodicals read by Saint Paul practitioners.

A perusal of the works to be found in any medical reference library will reveal the medicine of the period. One does not have to be told that there were no synthetic drugs. Calomel, iodides, iron, arsenic, antimony, and lead were the principal minerals used, though large doses of the last three were being discarded. Opium, quinine, digitalis, squills, ergot, and the balsams were the leaders among the vegetable drugs, and a host of other tinctures, extracts, decoctions, and tonics, of much vaunted excellence, were popular, but are now rarely used. The most unfortunate fact of the medicine of this and previous periods was that there was but one drug for the relief of pain—opium. Even if we had but this one drug now, surgery has so advanced that its use would be much more limited. Habitual use of opium and morphine was more common then, both among the people and among some of our early physicians. Also the drug could be purchased by anyone without restriction. Some irregular practitioners gathered vegetable drugs from the woods and fields, but for the most part medical men relied upon prescriptions mixed by pharmacists.

It is believed that the name of every physician practicing in Saint Paul up to this date has been given, and that something is known about most of them. Certainly those of whom little or nothing is known occupied no conspicuous or even mediocre place in the history of medicine in Ramsey County.

## 1860

In the manuscript division of the Minnesota Historical Society is a photostat copy of the federal census of 1860. This gives name, age, sex, social status, occupation, amount of real estate and personal property, and nativity. The names of persons in the medical profession are given below.

**Saint Paul**

| Name | Age | | Born |
|---|---|---|---|
| C. Knapp | 60 | Surgeon | Mass. |
| John Steel | 50 | Physician | Penn. |
| John J. Dewey | 38 | Physician | N. Y. |
| H. Wedelstadt | 40 | Physician | Lithunia |
| Alfred Berthier | 37 | Physician | France |
| Wm. H. Morton | 32 | Physician | S. C. |
| Joseph E. Tertl | 28 | Physician | Canada |
| H. N. Bushnell | 31 | Physician | N. Y. |
| E. Braun | 39 | Physician | Canada |
| Francis Hoffman | 28 | Physician | France |
| Wm. Caine | 38 | Physician | Isle of Man |
| Thos. R. Potts | 50 | Physician | Penn. |
| Gustav Rosenk | 42 | Physician | Prussia |
| Francis Rieger | 29 | Physician | Prussia |
| Franklin R. Smith | 57 | Physician | Penn. |
| Wm. H. Miller | 56 | Physician | Hanover |
| F. W. Fusshoetter | 28 | Physician | Prussia |
| Sam. Willey | 32 | Physician | Mass. |
| D. W. Hand | 26 | Physician | N. J. |
| Wm. H. Schell | 37 | Physician | England |
| G. A. Vervais | 35 | Physician | Canada |
| J. H. Steward | 30 | Physician | N. Y. |
| Alfred Wharton | 26 | Physician | Penn. |
| A. G. Brisbine | 37 | Physician | Ohio |
| Rudolph Albertez | 35 | Physician | Prussia |

**New Canada Township**

| | | | |
|---|---|---|---|
| R. Post | 60 | Physician | Conn. |
| Edward Boyd | 38 | Physician | Maine |

It will be noted that the list numbers twenty-seven. The omission of Dr. David Day's name cannot be explained. St. Anthony, though still part of Ramsey County, has not been included in the list. Steel should be Steele; Schell's name was Thomas Chatterton Schell. He came here in 1859. G. A. Vervais should be J. A. Vervais, and Albertez should be Alberti. Fusshoetter should be Hostetter. Drs. Mann and Phillips were then living on their farms at Cottage Grove. It will be noted also that the average age of the group is less than thirty-five years. Four of the group were homeopaths (Bushnell, Caine, Schell, and Boyd); and four were irregular practitioners (Rosenk, Miller, Alberti, and Post). No information as to the standing of Knapp, Berthier, Tertl, Hoffman, and Hostetter, is at hand. From other sources it seems probable that the name Tertl should be Hyrtl and that Berthier was a French Canadian, though he claimed to have been born and educated in France. Lithunia should be Lithuania. According to a personal communication believed to be reliable, Hostetter had a saloon on Seventh and Broadway and was the originator of Hostetter's Bitters. He went back to Philadelphia and made a fortune out of his bitters. The late Frank Werner, long connected with the police department, used to help Hostetter make them. Cyrus Knapp apparently was a legitimate practitioner but nothing is known about him. The census showed the population of the city to be 10,279; the entire county contained 12,150 persons. Of the inhabitants of Saint Paul, almost one-half were of foreign birth (4,659). This well illustrates the immigration to our state and city. Of the twenty-seven physicians listed, almost half of them were foreign born. As to the financial standing of these men, J. H. Stewart, whose name is also spelled wrong, was listed as the best off in worldly goods, his property being valued at $40,000. It is a noteworthy fact that in Saint Paul there was one physician of every kind to about every 400 people. Among the foreign names the French still predominated, though Germans were on the increase.

The year 1860 brought no great change in the personnel of the medical profession in Saint Paul as may be seen by the census. Late in the year two more physicians arrived who essayed the practice of medicine in Saint Paul—Dr. D. McCrae from St. Louis, and a Dr. Caldwell who advertised himself as an eye and ear specialist. The cards of these men in the papers are modest announcements, and they were probably legitimate practitioners. The year marks the beginning of local medical societies in Saint Paul. An institution called the Free Hospital for the Poor was established on the corner of Eighth and Jackson Streets in February under the auspices of the ladies of St. Paul's Episcopal Church, then under the leadership of Dr. Patterson. It was hardly a hospital at that time but rather a home for the aged and infirm which served free meals to the indigent and to poor children. More will be said of it later. It is true that a similar institution was started earlier, but there is some confusion as to the relations of the two institutions. The Saint Paul Academy of Medicine and Surgery was formed this year, being, as stated above, the first local medical society. The *Pioneer Press* of April 15, 1860, published a letter to the city council signed by Drs. T. R. Potts, W. H. Morton, and A. G. Brisbine, asking that body to elect Dr. Thomas R. Potts, President of the Saint Paul Academy of Medicine and Surgery, to the position of city physician and health officer.

## 1861

During the years of the war medical men in Ramsey County took an active part in military affairs. On April 29, Dr. J. H. Stewart and Dr. C. W. LeBoutellier, of St. Anthony, were appointed, by the Governor, surgeon and assistant

surgeon respectively to the First Regiment, and on June 15, Dr. T. R. Potts, Dr. J. H. Murphy, of St. Anthony, and Dr. D. C. Patterson, of Winona, were appointed to serve on a state board to examine into the fitness of candidates for appointment to medical positions in the army. Drs. Stewart and LeBoutellier were taken prisoners at Bull Run, and Dr. D. W. Hand was appointed July 25 to take LeBoutellier's place, as it was falsely reported that LeBoutellier had been killed. On October 4, Doctor Braun was appointed post surgeon at Fort Abercrombie. Stewart and LeBoutellier were paroled and Hand rapidly advanced, receiving an appointment as brigade surgeon on October 8. Potts was appointed post surgeon at Fort Snelling, and Foster served as commissary of subsistence with the rank of captain, a position which he held throughout the war. The state board for the examination of medical officers was now replaced by a federal board consisting of Dr. Gale of Minneapolis, Dr. Reiner of Marine, and Dr. Finch of Hastings. Dr. J. H. Murphy, of St. Anthony, on December 8 was appointed surgeon to the Fourth Regiment. On December 10, Hand telegraphed Morton to come at once as surgeon to the First Regiment. Hand, as brigade surgeon, was authorized to do this, but the appointment had to be confirmed by the governor. There was considerable opposition at home to Morton's appointment because he was a Democrat, but Hand assured the governor that Morton was capable, and asserted, in addition, that the men liked him. It would seem that every man in Minnesota who had a following attempted to raise a company of troops; among them was Doctor Rosenk, who wished the authority to recruit an artillery company. He stated that he had served two years in Russia and nine years in the Prussian artillery. George McDonald Lambert, who had been in the drug business, received an appointment as hospital steward in the Fourth Regiment. He was a son of Judge Lambert.

Apparently but two new physicians came to Saint Paul this year. They were Professor C. D. Williams, late of the Western College of Homeopathy at Cleveland, Ohio, who went into partnership with Dr. Wm. Caine; and a Dr. Adams, also a homeopath. In January, 1861, a Dr. D. B. Reid came to Saint Paul for his health and gave a series of lectures on practical chemistry. The Saint Paul Academy of Medicine and Surgery gave him the use of their rooms and laboratory for this purpose. More shall be said of Dr. Reid later.

The *Pioneer* for April 9 contains an item of considerable interest which deserves to be quoted in full:

> The Annual Supper of the Saint Paul Academy of Medicine was attended last night by nearly all the practitioners in the city, with their guests, the Mayor and Aldermen and representatives of the Press. It was a most enjoyable occasion, to the guests at least, who found the prescriptions of the doctors not "bad to take" and productive of healthful exhilaration.

In April the Christ Church Orphans Home and Hospital was reopened, having been closed for a short period; Dr. Brisbine and Dr. F. R. Smith constituted the medical staff. The papers, early in the year, announced that there was considerable hydrophobia among dogs in the southern part of the State; in May the disease reached Saint Paul and an order was issued to destroy all stray dogs. This order seems to have been effectively carried out and we hear no more of rabies in the city. In the early autumn Judge Lambert complained to the authorities that the Indians were killing large numbers of deer about White Bear Lake in violation of game laws.

*(To be continued in March issue)*

# President's Letter

THE program of the month on pneumonia received a surprising number of requests for additional information. February will deal with Pediatrics in general and especially with acute upper respiratory diseases, immunization and winter diets for children. In Minnesota we want to continue to emphasize the fact that high scientific standards and advancement of the public health combined, constitute our prime consideration. During the past month, however, we have turned our attention to social and economic phases also, and especially to government medicine. On January 14, an informative meeting was held where the workings of government medicine as it exists in European countries and in our neighboring state of South Dakota were portrayed by Mr. J. G. Crownhart, Madison, Executive Secretary of the State Medical Society of Wisconsin and Dr. B. A. Dyar of Pierre, South Dakota, Secretary of the Allied Professional Council, followed by Dr. C. B. Wright, Minneapolis, Dr. W. A. O'Brien, Minneapolis, Dr. A. Kuhlmann, Melrose and Dr. J. M. Hayes, Minneapolis. Dr. Gilbert Cottam, Minneapolis, opened the meeting with a talk on Americanism. Questions were raised by Dr. W. A. Coventry, Duluth, Dr. C. L. Oppegaard, Crookston, Dr. I. L. Oliver, Graceville, Dr. A. K. Stratte, Pine City and others.

The meeting gave us a picture of the problems involved in government and socialized medicine. Some felt that it struck a pessimistic note since no definite counter-program was suggested, but there was no time on this occasion for more than a factual presentation.

In Minnesota, experiments with group hospitalization insurance, a form of socialized medicine, are already underway. Private hospital insurance is also having a considerable sale. Many think that extensive hospital insurance would care for a large part of the immediate problem of the cost of illness and that if hospital service can be provided, other medical costs can be adjusted.

So far as insurance for medical care is concerned there are, after all, only a few methods of operation. One is by outside insurance companies. Another is by county or other local medical groups who organize non-profit services for their communities. Such services are being developed now in Cleveland, Michigan, Utah, Denver, California and New York. In our neighboring state of Wisconsin, in Douglas County, in which Superior is located, one of three experiments has been authorized by the State Medical Society. According to the Douglas County plan for a certain fee per month, members of the county society are going to attempt to give medical service to a local coöperative group. A third is by benefit societies, which have tried from time to time to provide medical services, including those in Los Angeles, Arkansas and other places that we have read about so extensively. Fourth, there is compulsory government health insurance.

Enumerations such as this simply call to our attention the tremendous amount of study needed. Realizing the difficulties involved, any proposed changes in our present system will be most carefully weighed by the profession of Minnesota.

Perhaps the continued orderly development and extension of services may continue here in the future as in the past, particularly as public health statistics prove Minnesota has achieved a place at the top. Certainly Minnesota, less than any other state, needs a radical change in its system of medical care.

GEORGE EARL, M.D., *President*
Minnesota State Medical Association

# EDITORIAL


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## OXYGEN IN AVIATION AND THERAPEUTICS

AS THE result of the work of numerous investigators, especially that of Barach[3] at the Presbyterian Hospital in New York, of Boothby[5] at the Mayo Clinic and of Waters[12] at the University of Wisconsin, oxygen has been used more and more extensively in the past few years for the treatment of anoxemia due to deficient saturation of the hemoglobin with oxygen from the lungs. Such anoxemia occurs in pneumonia, pulmonary edema and certain types of congestive heart failure. However, relatively scant attention has been paid to the use of oxygen in the treatment of anoxemia resulting from four other conditions. The first of these is the deficiency in mass of available oxygen that arises from diminution of physiologically efficient hemoglobin. Such diminution occurs in all types of anemia. In the second of the four conditions, anoxemia results from defective circulation; that is, the passage of blood through the capillaries is so slow that the oxygen is used up to an excessive extent. This state occurs in severe hemorrhage, surgical shock and certain types of heart disease. Third is histotoxic anoxemia wherein even if the pressure of oxygen in the tissues is normal, the cells cannot take up and use the oxygen; examples are poisoning from hydrocyanic acid, cyanide or alcohol. The fourth condition in which high concentration of oxygen is beneficial is in the treatment of patients suffering from the results of infection with an anaërobic or semi-anaërobic type of organism, as, for example, gas gangrene, in which local anoxemia is always present.

The extent of the damage to important organs and the possibility of this damage being repaired depends directly on the severity and duration of the lack of oxygen. Consequently, administration of oxygen must be started early and be continued for as long as is indicated, not only to ward off the cause of harm to the patient but also to give the body time to recover from the original cause of oxygen want or to give it time for adaptation.

The common clinical signs of lack of oxygen are cyanosis, which may be absent in anemia and often is difficult to perceive; a respiratory rate higher than 30 per minute; orthopnea and Cheyne-Stokes breathing; an increased pulse rate and restlessness and mild delirium. The clinical criterion of successful administration of oxygen is gradual disappearance of the foregoing signs.

The effects of lack of oxygen in disease are similar to its effects at high altitudes such as can be reached in airplanes. As a consequence of the rapid development of commercial and military aviation during the past decade there has been an increasing number of flights of several hours' duration, at altitudes above the critical point of

10,700 feet. Barach,[2] in his paper, "Pilot Error and Oxygen Want," emphasized the dangers that could arise from the anoxemia to which normal individuals are known to be susceptible at such altitudes; he pointed out, also, the possibility of accidents resulting therefrom. Armstrong and Heim found that exposure of normal subjects to a simulated altitude of 12,000 feet for four hours daily for twenty-six days produced concurrent mental and physical fatigue after each exposure, that these signs persisted for twenty-four hours and that they were manifested by difficulty in concentration, retention of ideas and attention over periods of time in excess of a few minutes. There was no evidence of acclimatization. Boothby and Lovelace[7] set the critical level at which a normal individual begins to suffer from tissue anoxemia at only 10,700 feet because at this point an appreciable decrease becomes manifest in the oxygen saturation of the hemoglobin of the arterial blood. Passengers with known, or perhaps unknown, cardiac or respiratory disease can experience serious or even dangerous evidence of anoxemia at much lower elevations.

One of the difficulties in supplying oxygen to counteract the effects either of high altitude or of disease has been lack of apparatus to deliver oxygen efficiently and economically. Boothby and Lovelace[7, 10] and Bulbulian recently have contributed to solution of these difficulties. They have designed a simple and efficient apparatus now known as the "B.L.B. inhalation apparatus." It consists, in part, of a nasal or oronasal type of mask and a reservoir-rebreathing bag. This device makes it possible to supply oxygen to both pilots and passengers and to maintain them at sea level conditions with a very small flow of oxygen. The apparatus has been found satisfactory and practical by flight tests made on commercial airlines, by several noted pilots, and at the Army Physiologic Research Laboratory at Wright Field in Dayton, Ohio, to a simulated altitude of 35,000 feet. The apparatus is equally applicable for the therapeutic administration of any desired concentration of oxygen up to 100 per cent and also for administration of any desired concentration of helium and oxygen mixtures. The cost of administering 50 to 60 per cent oxygen with this apparatus is about a fifth of what it is with the ordinary oxygen tent.

Possession of an efficient and economical apparatus for administration of gases stimulated Boothby and Lovelace[6, 7] to take up again work which once had been a major interest of the senior investigator. They confirmed the work of Fine and his co-workers that, in the majority of cases, the inhalation of 100 per cent oxygen would decompress the distended abdomen within twelve to twenty-four hours. However, they found that much better results were obtained when oxygen therapy was used in conjunction with Wangensteen's method of suction or drainage, employing the Miller-Abbot tube. In addition, they confirmed the work in which Fine and his associates demonstrated that the intense headache which ordinarily follows encephalography can be alleviated in about 80 per cent of cases by inhalation of pure oxygen for four to six hours. No ill effects have been observed as a result of breathing pure oxygen for as long as two days. On account of the possibility of pulmonary irritation from long continued administration of high concentrations of oxygen, it should not be used continually for longer than two days.

The inhalation of 100 per cent oxygen reduces the nitrogen partial pressure in the lungs to practically zero and, as a result, the nitrogen in the blood diffuses into the alveoli and is then expired, since gases always diffuse from a region with a higher pressure to a region of lower pressure of the particular gas. In the same fashion the resulting reduced partial pressure of nitrogen in the blood allows this gas to diffuse more rapidly from any body cavity, such as the intestines, subarachnoid space and ventricles, into the blood and thence into the alveoli of the lungs. Behnke and his co-workers have shown that 99 per cent of the nitrogen normally present in the body is eliminated in nine hours and a little more than 90 per cent in four hours. Inhalation of pure oxygen causes the hemoglobin to be completely saturated instead of only 95 per cent saturated. In addition, the amount of oxygen in simple solution will be increased about seven times. The combination of these two factors results in a 10 to 15 per cent increase in the amount of oxygen in the arterial blood.

The use of 100 per cent oxygen as an adjunct in the treatment of surgical shock was advocated by Boothby[6] and Lovelace[10] because of this in-

crease of 10 to 15 per cent of oxygen in the circulating blood and an even greater increase in the oxygen pressure in regions where local anoxemia has resulted from edema or stasis. Moon defined shock as "a circulatory deficiency, neither cardiac nor vasomotor in origin, characterized by decreased blood volume, decreased cardiac output and by increased concentration of the blood." He stated, further, that anoxia of the blood and tissues is a factor of utmost gravity in the operation of the vicious circle associated with shock.

Since transfusion of blood is often given in surgical shock to increase the oxygen-carrying power of the blood, and as a means of increasing the circulating blood volume and of elevating the arterial pressure, Boothby[6] and Lovelace[10] suggested that the combination of blood transfusion and inhalation of 100 per cent oxygen almost always would be indicated in the treatment of severe shock, since both measures increase the oxygen-carrying power of the blood. They have reported cases of mild surgical shock in which great benefit followed inhalation of 100 per cent oxygen without transfusion.

Mann and his associates have demonstrated that placing an etherized animal in the shock position increases the blood flow in the carotid artery 30 per cent; this would seem to explain why there is often an almost immediate improvement in the mental condition of a patient in shock when placed in such a position because of the increased oxygen pressure thereby produced in the cerebral tissues by the increased rate of blood flow. Other conditions treated with apparent benefit by the use of high concentrations of oxygen have been gas gangrene, tetanus, acute coronary thrombosis in its early stages, angina pectoris, pulmonary embolism, massive atelectasis and acute alcoholism. Several patients with migraine have been benefited by the inhalation of pure oxygen, according to Lovelace. When there is moderate to severe secondary anemia and it is necessary to carry out a major surgical procedure, it is advisable to administer oxygen postoperatively in order to decrease the demand on the circulatory system and to prevent localized anoxemia at the site of operation.

Because of the circulatory disturbance and anoxemia associated with seasickness, Boothby, in coöperation with Goulden, surgeon of the Canadian National Steamship Company, recently tried out the value of 100 per cent oxygen in four cases. The greenish ashen pallor, so characteristic of the seasick patient, disappeared immediately in all of the cases and marked relief, amounting to practical disappearance of vertigo, nausea and vomiting, was effected in three of four cases; there was only slight improvement in the nausea and vomiting in the fourth case although the patient "felt better."

With the B.L.B. apparatus, treatment of patients who have mild or severe asthma with helium and oxygen mixtures is rendered practicable, efficient and relatively economical. The helium and oxygen mixtures are also of great aid in the treatment of patients with severe emphysema and pulmonary fibrosis, acute pulmonary edema and all mechanical types of respiratory obstruction in the trachea and bronchi. Tracheotomy sometimes can be avoided.

W. Randolph Lovelace, II, M.D.

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## SENSITIVITY TO SULFANILAMIDE

VALUABLE, yes, even life-saving as sulfanilamide has proven itself to be in the treatment of a variety of infections, it cannot be too strongly emphasized that an appreciable percentage of individuals show a sensitivity to the drug.

It is not uncommon for symptoms such as malaise, headache, nausea, diarrhea, and cyanosis to make their appearance. With discontinuance of the drug, there is a rapid disappearance of symptoms.

Reports have appeared, however, of more severe symptoms resulting from sensitivity to the drug. High fever with or without chills, hemolytic anemia rapidly appearing after a day or two of medication, agranulocytosis and jaundice have been reported.

It is important, therefore, that patients be seen daily while sulfanilamide is being administered. Fortunately, the drug is rapidly eliminated through the kidneys, and most patients recover promptly from effects of the drug.

Certain precautions in the use of sulfanilamide may be emphasized. The drug should not be given to patients suffering from nephritis or liver disease. It should be administered with sodium bicarbonate to compensate for the increased elimination of sodium by the kidneys and to minimize the development of acidosis, which sometimes appears. Magnesium sulphate should not be given a patient receiving sulfanilamide, as it favors the production of sulfhemoglobinemia. Cathartics and excessive fluid intake, of course, minimize the effect of the drug.

Sulfanilamide is the name given by the Council on Pharmacy for paramino-benzene-sulfonamide. It is the same preparation as that which came out first as prontolin. Prontosil is a 2.5 per cent solution of an allied drug of complicated formula, supplied for parenteral administration. The name neoprontosil is now used to designate the preparation of prontosil, which is supplied not only in solution for parenteral injection but also in five-grain tablets for oral use. Neoprontosil is said to be less toxic and as effective as sulfanilamide in similar doses, although it gives off only a small percentage of sulfanilamide in the tissues. It is, therefore, concluded that its effectiveness is not entirely due to its sulfanilamide content.

It can be safely said that the addition of sulfanilamide to our armamentarium marks a milestone in the progress of therapeutics. This drug, however, must be used with caution.

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## TOPICS OF THE MONTHS

IN OUR December issue we mentioned editorially the proposal of our new president, Dr. George Earl, to institute a combined preventive medicine campaign in Minnesota of lay and professional education, known as the "Indiana Plan." The proposal having met with the approval of the officers of the component societies, and the various committees of the State Medical Association, the various agencies will presumably join in the combined attack. It will undoubtedly take some time for the program to get in full swing. The journal will coöperate as far as possible in emphasizing in successive numbers the subjects chosen.

January—Pneumonia and Respiratory Diseases
February—Pediatrics
March—Degenerative and Circulatory Diseases (including heart and kidney disease and diabetes)
April—Cancer
May—Obstetrics and Gynecology
June—State Board of Health
July—University Hospital
August—State Board of Control
September—Traumatic Surgery (including highway accidents, first aid, et cetera)
October—Syphilis and Gonorrhea
November—Tuberculosis and Respiratory Diseases
December—Anemia and Deficiency Diseases (including vitamin therapy).

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## POISON GAS

AT the Peace Congress held at The Hague in 1907 the subject of the employment of poisonous gases in warfare was discussed very thoroughly and the decision was finally reached that this method of warfare was inhumane and against the laws of civilization. There was but one dissentient and that was our own representative, Captain A. T. Mahan, U.S. N. retired, who gave reasons for his objections in terms which since, in the light of later experience, have proved to be thoroughly justified.

When the German Army first used gas in the form of chlorine in a surprise attack against a division of French Colonials brigaded with Canadians at the second battle of Ypres in 1915 the

world was horrified but before long both sides were straining their ingenuity to find more potent and efficient gases and these were used freely, chiefly in artillery bombardment, up to the end of the war. The chemicals found most useful in producing casualties were phosgene gas and the so-called "mustard," a heavy, volatile, oily liquid which emitted a peculiar smell suggestive of garlic or onions. Along with these were used tear and sneezing gases, principally for the purpose of interfering with the use of masks and thereby permitting the more lethal reagents to be inhaled.

Long before the close of the World War, military men and medical officers in all the armies became fully aware that the effects of these gases and chemicals had been greatly over-estimated. The immediate death rate among those exposed was very low and the ultimate after-effects practically negligible. The military value of Chemical Warfare, as it came to be designated in our army, consisted in its ability to upset the morale of troops and make temporary casualties of them. The French Colonials, mostly Senegalese, simply broke and ran in that first attack; the Canadians were able to hold their share of the line.

In our army the official figures covering all hospital admissions of battle injuries during our participation in the war show the following:

| | |
|---|---|
| Total battle casualties hospitalized | 224,089 |
| Of these, due to war gas, were | 70,552, or 31.4% |
| All others | 153,537, or 68.6% |
| Deaths, war gas | 1,221, or 8.9% |
| Deaths, all others | 12,470, or 91.1% |

After the war a very thorough investigation of the whole subject was made by the Chemical Warfare Service, the Surgeon General's Office and the Medical Research Laboratories of the Edgewood Arsenal, Maryland. The results of this study, as well as a summary of the reports of the British, French, German and Polish authorities, are set forth in *Army Medical Bulletin* Number 16 published in 1925 at the Medical Field Service School, Carlisle Barracks, Pennsylvania, in 115 pages. The conclusions, epitomized by Colonel H. L. Gilchrist, Director of the Chemical Warfare Service, himself a medical officer, are worth quoting: "The results attributed to the effects of warfare gases have been greatly exaggerated and this weapon is credited with more dire iniquities than have ever been associated with any other war weapon. . . . From the evidence thus far obtained it seems to be the consensus of opinion among medical men, not only in this country but also in Europe, that as a general rule there are comparatively few after-effects of warfare gases." The magazine *Time* recently quoted Dr. Francis Arthur Freeth, chief research chemist of Britain's Imperial Chemical Industries, as saying: "The amount of nonsense talked about poison gas is beyond belief."

All of which goes to indicate that there is no basis whatever for any undue excitement, much less hysteria, over any widespread danger from attack by poison gas.—G.C.

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### TUBERCULOSIS RESEARCH

APPROPRIATIONS for research in the study of tuberculosis during the coming year have been made to six leading universities in various parts of the country by the National Tuberculosis Association, according to an announcement received by the Minnesota Public Health Association from Dr. William Charles White, chairman of the Medical Research Committee. One hospital, Mt. Zion in San Francisco, California, also receives an appropriation for special laboratory work. This research is but one phase of the program financed by the National Tuberculosis Association's share of the five per cent of the funds raised through the sale of Christmas Seals in each state.

"Yale, Columbia, Cornell, Vanderbilt, Pennsylvania and Wisconsin universities will coöperate with us in our endeavor to achieve our final goal, the eradication of tuberculosis," said Dr. White. "Medical research will continue to be one of the strongest battle-lines against tuberculosis in 1939."

Two projects are now under way at Yale. Further study of the chemistry of the tubercle bacillus, the germ which causes tuberculosis, is being conducted by Dr. R. J. Anderson of the Department of Chemistry. Dr. Robert Thomas is in charge of another which deals with the physiological aspects of the substances of the tubercle bacillus.

The University of Wisconsin, under Dr. Horace Getz, will pursue research to determine the ingredients of cod liver oil which make it valuable in the treatment of tuberculosis. At Cornell, the biology of the tubercle bacillus inside living cells will be studied microscopically by Dr. Morton C. Kahn.

At Henry Phipps Institute of the University of Pennsylvania, further study of tuberculin will be continued with a view to establishing a more completely standardized product. Dr. Florence B. Seibert, recipient of the Trudeau Medal in 1938, is working on this project. The Moore School of Electrical Engineering of the University of Pennsylvania, under Dr.

F. Maurice McPhedran and Prof. Charles Weyl, is engaged in the improvement of x-ray technic.

It has long been known that in diabetics, tuberculosis runs a rapid and intensive course. Research to learn the causes back of this relationship will be conducted by Dr. M. Maxim Steinbach of the Columbia University Medical School. Dr. Steinbach will also direct his efforts to a study of increased susceptibility to tuberculosis during puberty and among schizophrenics. The chemistry of the proteins and carbohydrates which are contained in the tubercle bacillus will also be taken up at Columbia by Dr. Michael Heidelberger.

A joint study on the causes of calcifications appearing in x-ray plates in the human lung, which resemble those found in healed tuberculous lesions, will be conducted at Vanderbilt University under the direction of Dr. Henry C. Sweany.

Dr. Charles Weiss of Mt. Zion Hospital in San-Francisco will correlate findings in that institution on the active chemical principles in the white blood cells found in pleural fluid.

This program, which benefits every state through the development of new knowledge and technic for fighting tuberculosis, is but one phase of the program of the National Tuberculosis Association financed through the five per cent of the Christmas Seal sale received from each state. In Minnesota, the ninety-five per cent of the proceeds of the seal sale retained in the state makes possible specific projects in each county and a far-reaching state-wide program, including tuberculin testing and x-ray surveys of school children, sanatorium follow-up nursing service, health inspection and medical examination of school children, clinics, short courses on tuberculosis and x-ray consultation service for doctors, and an extensive campaign of child and adult education.

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### The Interstate Service

The Bureau of Investigation of the American Medical Association reports that a concern known as the Interstate Service at 111 West Jackson Boulevard, Chicago, appears to be writing to physicians with the hope of developing private prescriptions into nostrums. Part of the promotional letter reads:

"How often have you thought of a favorite and unusually effective prescription that you would like to make available to the general public? One that could take its place with many of the proprietary preparations now generally on sale. . . . Let each specialist keep within his field. And only by collaboration can the greatest good be achieved. We address you, a physician, as specialists in the field of mail-order selling. And, as such, we say that the cost of launching such a venture is moderate. You provide the formula. It is our business to help sell it for you."

No reputable physician would, of course, lend his services, knowledge or personal treatment to such a performance. It is a peculiar form of stupidity that would lead a promoter to put out such an appeal at a time just after the new Wheeler-Lea and Food and Drug legislation have been passed. (J.A.M.A., Dec. 24, 1938, p. 2409.)

# In Memoriam

### Lewis Nelson Klove

1872-1938

DR. LEWIS N. KLOVE, a resident of Minneapolis for many years, died in November of a heart affliction at the age of sixty-six.

Dr. Klove was born May 22, 1872, at Northwood, Iowa, of Quaker stock. He attended Grinnell College, Iowa, and received his M.D. from the University of Minnesota Medical School in 1903. After taking his interneship at the Swedish Hospital in Minneapolis, Dr. Klove practiced for several years in Minneapolis. He then practiced for seven years in Wanamingo, three years in Chokio, and later in Kensington and Wright, all located in Minnesota, returning to continue practice in Minneapolis in 1929.

Surviving him are his wife, Celia, whom he married on June 8, 1910, and two sisters, Mrs. Ed. Thone of Kindred, N. D., and Mrs. Ida Stewart of Missouri.

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### Irving C. MacDonald

1874-1938

DR. IRVING C. MACDONALD was born in Minneapolis, Minnesota, on March 16, 1874. He attended the grade schools in Minneapolis and then moved to Grand Forks, North Dakota, where he received his high school education, as well as his college education at the University of North Dakota. He was principal of the Buckston High School from 1895 to 1898. He gave up this position to enter the University of Minnesota Medical School from which he graduated in 1902. After completing his year of interneship at St. Barnabas Hospital he located in North East Minneapolis.

In 1920, Dr. MacDonald married Miss Agnes Smith. In 1930, he moved his office to the Medical Arts Building where he practiced up to the time of his death. He had been a member of the Staff of St. Barnabas Hospital for over twenty years and was Chief of Staff two years ago. He was a physician for the Northern Pacific Railway for a number of years. He was a member of the Hennepin County Medical Society, American Medical Association, Alpha Kappa Kappa, Masons, Scottish Rite, and Shriners, also a member of the Lafayette Club. He was a member of the Presbyterian Church.

Dr. MacDonald had not been very well the last few years of his life. He was taken sick late Sunday, December 3rd, 1938, and died Monday night at 11:30 p. m. He was partly conscious for a few hours only.

Dr. MacDonald was a conscientious and trustworthy physician with good judgment and his patients had great confidence in him. He was particularly skilled in obstetrical work having attended over 3,400 confinement cases during his years of practice, and lost but two mothers during this time. He began his practice in the horse and buggy days and drove a

good team. He was always equipped and ready to respond to any emergency calls night or day. When the autos appeared on the streets of Minneapolis, he was one of the first to recognize their value as a means of transportation for physicians and purchased one of the contraptions, a Ford Car, No. 916, the first of that make in the state.

Dr. MacDonald was sociable and well liked by his conferrers, even tempered, agreeable, and enjoyed a good story. We will all miss his company. We have lost a friend and his patients a good physician.

Dr. MacDonald was sixty-four years of age at the time of his death. He is survived by his wife Agnes, and son John, aged seventeen.—A. E. BENJAMIN.

### Lewis K. Onsgard

1866-1938

DR. LEWIS K. ONSGARD, a physician for the past forty-six years in Houston, Minnesota, died October 24, 1938, following a ten years' illness.

Dr. Onsgard was born near Spring Grove, Minnesota, January 1, 1866. He was reared on his parents' farm, educated in the public school, and attended the Eclectic Medical College at Cincinnati, Ohio, from which he obtained his medical degree when he was twenty-one years old.

After practicing five years in Harmony, Minnesota, Dr. Onsgard moved to Houston. On May 20, 1889, he was married to Miss Anna Laugen of Houston. He began his practice before the days of hard-surfaced roads and high-powered autos and his days and nights were filled with driving about on the country roads in bad and good weather. He untiringly gave of his ability for the welfare and improvement of his community. He served for many years as member of the board of health and coroner.

Dr. Onsgard was a charter and affiliate member of the Houston-Fillmore Medical Club, a member of the Olmsted-Houston-Fillmore-Dodge County Medical Society, the Minnesota Medical Association and the American Medical Association. He was an affiliate member of the Minnesota State Medical Association and Congress of Railroad Surgeons. Early in his career he was appointed as company surgeon for the Chicago, Milwaukee, St. Paul and Pacific Railroad Company and remained the company surgeon until his death.

Surviving Dr. Onsgard, in addition to his widow, are two sons, Orrin Onsgard and Dr. L. Kenneth Onsgard, who has his father's practice in Houston; three daughters, Agnes Onsgard of Houston, Mrs. A. M. Hanson of Albert Lea, and Mrs. P. F. Johnson of Houston; a brother, Martin Onsgard of Spring Grove, Minnesota; and a sister, Mrs. T. Jensen of Spring Grove.

### Jerome F. Smersh

1892-1938

DR. J. F. SMERSH, of Owatonna, died from pneumonia, October 27, 1938. A native of Owatonna and the son of the late Dr. Frank M. Smersh, he had carried on an active surgical practice there since May, 1919.

Dr. Smersh was born September 30, 1892, attended the public schools of Owatonna, and graduated from the Owatonna High School in 1911. He received his medical degree from the University of Minnesota medical school in 1917, and served his internship at the Ancker Hospital the following year. Entering the service, he spent a year as surgeon in the United States naval base hospital at Great Lakes, Illinois, attaining the rank of lieutenant, senior grade.

Dr. Smersh became president of the Board of Health of Owatonna in March, 1936, and was still serving at the time of his death. He became a member of the American College of Surgeons in October, 1936.

Dr. Smersh was married April 12, 1921, to Miss Ann Dapper of Faribault. Two sons, Jerome and Thomas, and a daughter, Rita, as well as his widow, survive; also his mother, who lives in Owatonna, a brother, Clement, and a sister, Mrs. Herbert E. Clefton, of Minneapolis.

BEAUMONT AND ST. MARTIN

"Beaumont and St. Martin" is the first of six large paintings in oil memorializing "Pioneers of American Medicine" which artist Dean Cornwell will complete in the next few years. Others in the series are: Dr. Oliver Wendell Holmes, Dr. Ephraim McDowell, Dr. Crawford W. Long, Dr. William T. G. Morton, and Major Walter Reed, and one woman, Dorothea Lynde Dix who, while not a physician, stimulated physicians to study insanity and feeblemindedness.

Arrangements to supply physicians with free, full color reproductions of "Beaumont and St. Martin" without advertising, and suitable for framing, have been made with the owners, John Wyeth & Brother, of Philadelphia, Pa. Send your request to MINNESOTA MEDICINE, 604 National Bldg, Minneapolis, or 2642 University Ave., Saint Paul.

# MEDICAL ECONOMICS

**Edited by the Committee on Medical Economics**
**of the**
**Minnesota State Medical Association**
**W. F. Braasch, M.D., Chairman**

## COMPLETE THE SURVEY

**The National Health Program is now before Congress. Will it be shaped to meet the actual needs of the American people? Or will it be an extravagant and burdensome piece of legislation based upon doubtful studies and mistaken statistics?**

**Much depends now upon the Study of Needs and Supply of Medical Care of the American Medical Association.**

**The final form 1-F went out to all members late in January. This form provides for another daily record of medical services for the week, February 5 to 11, inclusive. When it is complete it should be sent to the Bureau of Medical Economics, American Medical Association, 535 North Dearborn Street, Chicago, Illinois.**

**This is the conclusion of the Survey and it should be filled out conscientiously by every member. Tabulations MUST BE COMPLETED by March 1, for report to the House of Delegates of the American Medical Association.**

**Let's complete the job in Minnesota!**

## FORUM ON MEDICAL CARE

Three hundred and sixty physicians and a group of dentists, hospital executives and social welfare workers attended the Forum on Medical Care, Saturday, January 14, at the Saint Paul Hotel.

Excerpts from the important talks made by visitors at that meeting, by Mr. J. G. Crownhart, secretary of the State Medical Society of Wisconsin and by Dr. B. A. Dyar, Pierre, S. D., executive secretary of the Allied Professional Council in charge of medical and health services in South Dakota, follow:

### "No Profit . . ."

**Mr. Crownhart:** There is no profit to the physician in promoting anything that is not good for the public health.

We must be assured before we adopt any new plans for the delivery of medical care that they will in truth benefit the health of the people.

### Conflicting Reports

Many conflicting reports have been brought back from England, Germany, and other European countries concerning the benefits or lack of benefits of their sickness insurance systems. The reason for these differences appears to lie in the fact that each inquirer goes armed with introductions to different departments and officials. The labor leader bears introductions to labor leaders who see the situation from one point of view; the social worker goes to the social service department and gets another point of view; the physician to physicians and secures still another version. Furthermore, these European systems are no longer experiments. They are established systems of many years' history. It requires time and painstaking inquiry to get at all phases of them. What you learn in the last 15 minutes of an interview may entirely change the conception gained in the first hour.

Out of many interviews it became evident to me that certain definite factors are common to all government systems. Presumably they would characterize any government sickness insurance scheme that might be set up in the United States also.

### Premiums Are Fixed

*The first is that insurance premiums are fixed.* A definite percentage is taken from the employe's wage, and from the employer's payroll. A definite amount is added by the government.

This is the fund then, that must provide for medical care when the employe is ill, for limited care and compensation to the permanently invalided; for compensation for wage loss during illness.

We sometimes hear that we can have the medical care in the United States without the wage loss compensation or compensation for the disabled. It is the opinion of the International Labor Commission at Geneva, however, that it is

impossible to have one of these three without the others.

Thus, there is a fixed amount to cover a threefold demand; but medical care is not a fixed item. Physicians do not remain in a groove. They develop x-ray, for instance, for diagnosis and treatment; they develop serums for control of disease and fever therapy.

### No Money to Provide

These procedures are socially cheap. They save lives, prevent disability, but they are initially expensive and they require an outlay never anticipated in fixing premiums. Consequently, there is no money to provide for them.

The Administrator is obliged to balance his books and he does so by ignoring advances in medicine. His problem is this: On the one hand there is a fixed sum of money; on the other hand there is an unknown demand for medical service. No one has any idea how many people will be sick.

The physician must supply the unknown demand at so much per person per year and he, rather than the government, is the real insurer against this demand.

### He Stays by the Book

He is supplied for the purpose with the "book." The book is a special pharmacopeia for insured patients and it contains all of the drugs and amounts which he may officially prescribe for his panel patients. If he exceeds the amount indicated or if he prescribes a new and expensive drug he must explain his action to the Administrator. If the Administrator is not satisfied with the explanation—and often he is not—then he must explain it to the panel committee composed of laymen. If the committee is not satisfied, the physician must pay for the drugs himself. Disease does not stay in the book; but it is natural that most physicians should stay in the book if they wish to get along.

*The second is that free choice of physician, though nominally allowed in many systems, means, only, that the patient may indicate his choice of names on the panel when he becomes insured.* Under ordinary conditions his freedom of choice ends there and he must remain with the physician of his original selection.

### Cost of Administration

*Third: Insurance systems do not administer themselves.* Even in England, known to have a fine concept of Civil Service, the cost of administering is 17 cents out of every sickness dollar. In all countries the cost runs from 17 to 20 per cent. Somebody must check the insurance rolls; somebody else must check the "book"; somebody else must check those who are reported sick to see if the sick man is really in bed and really needs the money. Somebody else must audit the accounts. Incidentally, this is how the sickness checkup sometimes works. Mr. B—has been sick with a bronchial ailment and is reported unable to work for another week. The checker goes to Mr. B—'s house, finds him working in his garden. The doctor says it's all right for Mr. B— to work in his garden; it's good for him; but Mr. B—is not yet well enough to go back to his work in one of the dusty trades. The Administrator fails to understand the distinction and the doctor dares not stand out against the Administrator. Mr. B— goes back to work.

### One to Fifty

In all countries there is a least one employe to every 50 to 100 insured persons—in Wisconsin that would mean about 2,800 employes would be needed to administer a system for all employed persons.

*Fourth: The Administrator inevitably becomes a trustee of funds and not, as one might expect, a guardian of the public health.* He finds, at once, that every insured person wants "all that's coming to him"—and more. He knows, at the same time, that only about two per cent of the population is likely to be sick at any one time. On the one hand there is a heavy demand for care, some of it unnecessary—on the other is a fixed amount of money which must be made to cover all demands. His job becomes one of guarding his money, dogged always by the fear that it will not last the year.

It is noteworthy, at the same time, to contrast the headquarters of the sickness insurance administration in every country with most of the hospitals.

### Ancient Hospitals

You see many hospitals where wonderful work is being done in spite of limited facilities in

ancient buildings with old equipment. But the headquarters of the administrative system are new and modern in every respect.

### At the Mercy of Parties

*Fifth: The physicians are universally at the mercy of whatever political party may happen to be in power.* In Vienna, I looked in vain for several noted physicians, most of them Aryans, famous physicians to whom I had been given letters of introduction. They had left Vienna; they would not be back. Why? Because they were not in sympathy with the Nazi party in power, and this was not exclusively a Nazi phenomenon. Nazi predecessors had banned other physicians before them. Sickness insurance systems cannot be separated from politics and government.

*Sixth: Physicians are everywhere over-loaded.* There is never time to give the individual patient all of the attention he needs.

### "What Can You Learn?"

In an English teaching hospital where I spent several hours observing and asking questions, American-designed equipment and even American text books were being used. At the end of my visit, the chief of staff said to me: "And now may I be permitted to ask you a question? What is it that you, an American, can possibly learn from us?"

Medical care under European sickness insurance systems is a salvage service, only. There is neither time nor money for tracking down disease and opening up new fields.

Are we, then, to transfer these systems to America? Would they fit into our American scene?

### Must Tell What It Means

That is for the people themselves to determine. The profession of medicine is only about 1000th of the population. Alone, you cannot hope to determine what the answer shall be.

Many proposals are being made today and the people know them by name, only. Their sponsors tell how the law might read. They do not tell what it means. The people must know what these proposals mean to them if they are to make a wise choice. You, the physicians, must tell them.

### Doctors Were Leaving

**Dr. Dyar:** Some of the things we have done in South Dakota might be regarded as unorthodox; but we had a drought in South Dakota and we had to do unorthodox things to meet the conditions.

Many counties were so heavily in debt that they could not hope to handle their legal obligation to care for the sick. Many fine doctors were moving away because there were no patients left who could pay medical fees. Unless something could be done immediately, the majority of the people were going to be left without doctors or medical facilities.

### Emergency Measures

Various emergency measures were tried in different localities. In one, funds were secured from the Children's Bureau to maintain a health unit, doctor, nurse and clerk, who provided medical care in the county. In another, aid was secured from the United States Public Health Service.

### Farmers' Aid

The medical program of the Farm Security Administration began in May, 1937, with a Farmers' Aid Corporation organized to handle the funds turned over by the Administration for emergency medical care of its clients. At first, this service was available only to standard loan cases. Now, it is available to all who wish to join for $2 a month per farm family. Out of 40,000 farm family clients of the Farm Security Administration, 27,000 are members which means that about 135,000 are supplied with medical service.

The service is exclusively of an emergency nature. From November 1, when the service was re-organized, to the end of the government fiscal year, July 1, each family paid $16. One eighth of this amount was paid out each month for medical service. Any surplus above the need was pro-rated to participating doctors and dentists. The funds were paid out on the following scale: 51 per cent to physicians; 30 per cent to dentists; 15 per cent to hospitals; three per cent to pharmacists; one per cent to nurses (nursing care is not provided outside of the hospitals).

### Difficulties

The administration of the service is complicated; we have had our difficulties.

First, with the doctors—A few of the doctors, knowing that they were going to get cash for their services, were not too particular to keep it to emergency care.

### Unnecessary Services

Some rendered expensive and unnecessary service to cash in on the program. For instance, one sent a bill for six separate examinations and office calls (total $24), for treating six children in one farm home who had the itch.

Some, who operate small hospitals, unnecessarily hospitalized some cases, charging a hospital bill and $1 a call for each call.

### Collecting Old Bills

Some used the program to collect old bills, moving the dates of old, unpaid-for services up to the date of the Farm Security program.

Occasionally, the doctor instructed the client to pay him direct, promising to reimburse the client if he collected from the Farm Aid Corporation.

Then there were difficulties with the clients—Some farmers attempted to cash in on the service immediately with new teeth and glasses neither of which were allowed. Some county commissioners, undoubtedly, promised farm clients any type of service including glasses, teeth and care for chronic ailments provided they joined.

Some clients refused to join until an acute illness arose and they needed expensive service.

### Neurotic Shoppers

Some clients became neurotic medical shoppers, going from doctor to doctor just for the pleasure of having a physical examination.

The situation was made more difficult for the doctors and the Farmers' Aid Corporation by county commissioners who tried to lighten their load of indigent by sending relief cases to the Farmers' Aid Corporation.

### Free Choice

Now, as to the good points of the program—There is no question but that some of our farm families are getting better care than they had before, especially in confinement cases.

The program is confined to the regularly licensed physicians.

Also the patient has free choice of physician.

Furthermore, many fine physicians have been enabled to remain in the state. If they had left, many less desirable practitioners, particularly foreigners who are constantly inquiring for opportunities, would have moved in.

Most of the doctors wish to continue the program even if they can collect only 50 per cent of their fees for the work they do.

For the future in South Dakota and anywhere else where such a program may be organized, I have these suggestions to make:

### Suggestions

1. That all clients be given a physical examination before they are admitted to the service.

2. That the Farm Security Administration arrange for all clients to join so that costs can be spread.

3. That a limit be placed upon hospital days and medical service available through the program.

In theory, this is the best plan I have seen in operation anywhere for care of low income and border line farm families. Where doctors and clients are honest, it works.

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## MEDICAL POLICIES AND PROGRAMS

Programs and policies for 1939 of the various sub-committees of the Committee on Medical Economics were discussed by respective chairmen, at a meeting called January 4, by the general chairman, Dr. W. F. Braasch, Rochester.

As a result of this conference several changes in the general structure of the committee will be proposed to the Council at its next meeting. If the Council approves, another sub-committee devoted exclusively to the study of sickness insurance will be formed as part of the general committee. No such committee now exists in Minnesota and the need for it, as more and more plans are being formed and tried out elsewhere, is obvious.

### Adding Industrial Health

Industrial health problems will be added, also, to the work of the Sub-committee on Industrial Relations, of which Dr. M. S. Henderson of Rochester is chairman. This committee has concerned itself, heretofore, with workman's compensation and relations with insurance companies. The new function is prompted by the increasing importance assumed by health prob-

lems of industry, recently signalized by a new committee on Industrial Health formed by the American Medical Association and also by the new program on industrial health which will be initiated by the State Department of Health in Minnesota if appropriations are made by the Legislature at this session.

### To Avoid Overlapping

The usefulness of these occasional conferences of committee chairmen was clearly evident at the January meeting. All are dealing with matters of great moment to the medical profession in Minnesota; but their work must be evaluated periodically and brought into line with the working program of the association so that there will be no overlapping and so that no vital matters will be overlooked.

### Talks to Small Groups

It was generally agreed that medical students are not sufficiently instructed in the vital details of their social and economic relations to fellow practitioners and to the public and that such instruction might well take the place of much of the detail work with which the curriculum is now crowded. It was suggested, however, that informal talks to fraternity and other small groups might be more effective than formal required lectures. Also, that the committee might function in assisting in the instruction of these speakers.

### Promoting Interprofessional Relations

Chairman B. J. Branton, Willmar, of the Medical Advisory Sub-Committee, reported that there had been fewer malpractice cases, by half, during the past six months than in previous periods in Minnesota. This fine record is the result of three years of effort by the committee to promote a better sense of responsibility toward each other among the members of the association. Excellent relations with the bar association and with insurance companies were also reported by Doctor Branton. In this connection, a series of six interprofessional meetings throughout the state are being arranged by the committee in coöperation with the Interprofessional Relationships Committee, of which Dr. Savage of St. Paul is chairman. Lawyers, dentists, and physicians join in these meetings, the next one of which is scheduled for February 13 at the St. Paul Athletic Club.

### For Farm Security Plan

The request made of the Council at its December meeting (see January issue MINNESOTA MEDICINE) for a medical service plan for Minnesota clients of the Farm Security Administration was at that time referred to the Sub-Committee on Low Income and Indigent Problems. Dr. W. A. Coventry, chairman, was not present at the conference but it was announced that a special meeting to study the proposal had already been called and that immediate consideration would be given to the matter.

It was the opinion of the chairmen present that the state association committee should not refuse to assist Farm Security Administration officials in the development of a plan in Minnesota since both Minnesota clients and their physicians would otherwise suffer. So far as the physician is concerned, in this case, the patient pays his own fees. The money is provided by loan from the Farm Security Administration.

### Dissatisfaction

Doctor Henderson reported considerable dissatisfaction with the handling of industrial insurance cases because the choice of the patient is often ignored in the referral of industrial cases.

Dr. J. M. Hayes, Minneapolis, outlined the "gentleman's agreement" arrived at earlier with the Industrial Commission by which choice of the patient was to be recognized and fees paid.

It was suggested that another meeting be held with the commission soon to clarify the entire matter; also that a representative of the Minnesota Federation of Labor be present to convey to the commissioners Labor's declared preference for choice of physician in industrial medical practice.

Dr. George Earl, Saint Paul, President of the Minnesota State Medical Association, outlined the Association's 1939 "Co-ordinated Medical and Public Health Program" which begain with the January program of education on pneumonia prevention and control.

### Real Problem

According to Doctor Earl, medical association representatives should establish it definitely that physicians are primarily interested in the health of the people. They recognize, of course, that medical costs have increased and they are carefully studying all proposals to ease economic burdens of sickness. In Minnesota, at least, medical care is better than average and above the level of other essentials, such as food and housing. The real problem lies with the man with the $100 a month income who feels that government care is the answer to his problems. For him, group hospital insurance can bring a major assistance in payment of costs of illness and, perhaps, no further experiments in sickness insurance should be tried while group hospital insurance is being developed and extended in Minnesota.

### For Training Speakers

The Forum on Medical Care scheduled for January 14 in St. Paul was designed to assist in the training of all physicians in the intelligent discussion of the social and economic problems of medicine, with friends or patients and before the public. The question remains, Doctor Earl said in conclusion, how much shall these matters be stressed in public.

Dr. F. A. Olson of Minneapolis, chairman of the Sub-committee on Contract Practice, recalled that the American Medical Association was at one time opposed to helter-skelter discussion on the subject.

Dr. Buie was of the opinion that speakers should not be left to volunteers.

### Must Be Prepared

"We are being called upon to speak," Doctor Braasch said, "and we must be prepared to respond. That means that we must be thoroughly well informed, that we must understand the lay point of view and be sympathetic toward it while we undertake to explain fully the issues involved.

"The Co-ordinated Medical and Health Program instituted for 1939 by the state association is a step in advance in our public relations and an excellent approach to education concerning the philosophy and standards of our American system of care."

## COUNTY OFFICERS TO MEET

Important speakers and timely discussions will mark the 1939 program of the annual County Officers' Conference scheduled for Saturday, February 25, at the Saint Paul Hotel.

Round table breakfast discussions will begin at 8 a. m., and continue until 10. The Medical Survey, medical relief service under the "choice of vendor" legislation, group hospital insurance, medical care for Farm Security clients and membership will be discussed at this informal session.

A symposium on methods of public education will follow with outside experts in platform speaking, radio and newspapers as speakers.

Industrial hygiene and workmen's compensation will be the subject for a second symposium which rounds out the morning program. On this section of the program representatives of Labor, of the Industrial Commission and the insurance companies will talk; also the new program for industrial health contemplated by the State Department of Health will be outlined.

For the afternoon, the general subjects will be national and state legislation on health and medical problems. For these discussions, Dr. R. G. Leland, director of the Bureau of Medical Economics of the American Medical Association, will be present and representatives of both the House and Senate of the state legislature will talk.

The meeting comes at a time when the air is full of plans, rumors, public and private discussions on medical care. It provides a unique opportunity for discussion and exchange of information. Travelling expenses of one representative from each society will be paid as usual by the association. Every member is invited to attend, however, and all will be guests at luncheon.

## AS ONE READS, SO ONE THINKS

(Monthly editorial prepared by the Medical Advisory Committee.)

Headlines in papers, sketches in magazines, editorial writers, and radio commentators depict the changing world. As the world thought and map changes, so medicine is an ever changing science. The books and procedures of ten years ago become obsolete in the new light of today. Progress cannot be stopped, and he who wishes to turn back the pages to yesterday finds himself lost in a maze.

But, fundamentally, the ideals of the medical

profession are the same. Unselfish service to others has become a part of the life and being of the medical man. Monetary gain has been a secondary consideration; the wealthy physician is a rarity. Success in our work is not measured by material wealth but by the regard in which we are held by our clientele. This success depends, of course, to a great extent on natural ability; but, added to natural ability must be industry, integrity, and a clear, professional understanding of the problem at hand. The physician-patient relationship is a sacred thing which no amount of legislation can take away.

Your Medical Advisory Committee does believe, however, that the physician-physician relationship can be improved by closer and clearer understanding of the other physician's problems and less criticism of his work.

Study in post-graduate centers, fraternizing with those from a distance and attendance at society meetings of our own soon scatter the cobwebs in destructive thinking. Participation in programs and the writing of papers maintain up-to-dateness and equilibrium of ideas.

But, withal, one should not forget that we are citizens with specialized training entitled to the same protection afforded other citizens under the law and, as such, we have a clear right to the fruits of our labor in proportion to the time spent in preparation and the ability gained by the successful use of this preparation in the service of suffering humanity.

Happy is he who each day spins one more thread into the pattern of a successful life.

—B.J.B.

## THE DOCTOR'S BILL

(Paragraphs from an important leading editorial which appeared in a recent issue of the *Chicago Tribune.*)

The indictment of the American Medical Association and some of its directing officials was not a courageous act in the sense that the Administration is likely to lose great numbers of votes as a result of its action. The probabilities, fortunately, are all the other way. . . .

When everybody else sends flowers, the doctor sends a bill. All too frequently it arrives when the family is hard-pressed because of loss of income resulting from the illness itself and because drugs, nursing, hospital care and special diets have imposed unexpected burdens upon the family budget. . . . Illness itself inspires in the victim and his family a sense of injustice. . . .

Accordingly, many citizens would welcome state or socialized medicine.

The medical association has resisted that trend with all the vigor at its command, believing that if doctors had to look to the government for support, the quality of medical service and the competence of the profession would decline rapidly.

The present administration in Washington is eager for new fields of activity to dominate. . . .

Whatever the faults of the present organization of medicine, the fact is that disease and death rates have dropped to the lowest point in the history of the country. Medical science has made phenomenal progress, thanks in no small part to the activity of the medical association. . . . Families of moderate means constitute the largest single element in the population. If their needs were not being met pretty satisfactorily now the death and disease rates would be rising, not falling.

The doctors have recently proposed a plan which deserves sympathetic study. They suggest that the risk of illness among persons of small income be covered by insurance with an annual premium which would not place an undue strain on the ordinary family's budget and which would cover ordinary risks. . . .

In spite of the fact that its material rewards are not great, medicine, today, attracts and holds superior young men and women; it would not do so if they felt that their future depended on governmental favor rather than personal attainments. Experience teaches that there is far more reason to place confidence in the high purpose and altruism of the doctors than in the tall talk of politicians or the wishful thinking of professional reformers.

## NORTHWEST CONFERENCE

The annual Northwest Regional Conference takes on an especial importance this year as Congress awaits introduction of legislation embodying the National Health Program and as several state and county societies prepare to embark upon new experiments in prepayment plans for care of the sick.

The date selected is Sunday, February 12, one day in advance of the Annual Congress on Medi-

cal Education and Licensure. The place is the Palmer House, Chicago. The Missouri State Medical Association, of which Dr. Carl F. Vohs of St. Louis is president, is host society for the meeting.

Among program features of great interest will be reports on the new medical programs in Michigan and in California; a review of the legislative situation in Washington by Dr. R. G. Leland, director of the Bureau of Medican Economics of the American Medical Association, and a review of the progress to date of the Survey of Medical Needs and Supply, conducted all over the United States under the auspices of the American Medical Association, by Dr. W. F. Braasch of Rochester, chairman of the National Advisory Committee on the Survey.

All medical society officers and interested members are urged to attend this meeting.

Minnesota physicians will recall that the Northwest Regional Conference originated in Minnesota and was held for many years in Saint Paul, with the Minnesota State Medical Association as host. Removal to Chicago was occasioned by the participation of distant East Central states in the deliberations.

## MINNESOTA STATE BOARD OF MEDICAL EXAMINERS

### Windom Osteopath Fined $250.00 for Practicing Medicine Without License

Re: State of Minnesota vs. John L. Moore.

On December 22, 1938, John L. Moore, a licensed osteopath with offices at Windom, Minnesota, entered a plea of guilty to an information charging him with the crime of practicing medicine without a license. The Honorable Charles A. Flinn, Judge of the District Court at Windom, sentenced Moore to pay a fine of $250.00 and court costs of $7.00. Moore paid the fine and costs in preference to serving a jail sentence.

The complaint against Moore was filed by Mr. Brist on behalf of the State Board of Medical Examiners following an investigation which disclosed that Moore was prescribing and furnishing medicine for the internal use of patients. In the instant case Moore had furnished and administered an alleged cough medicine for a 2-year-old girl. The little girl suffered a burn on the side of her face when some of the medicine came in contact with her face following her refusal to take the medicine. The parents attribute the burn to the cough medicine. Moore then prescribed some medicine for the burn.

The Medical Board's investigation disclosed that Moore was writing prescriptions that were being filled at one of the local drug stores for medicines of various kinds, all of which were to be taken internally. The records of the Medical Board show that Moore was warned as far back as 1930 to confine his practice to osteopathy, for which he holds a license.

## OF GENERAL INTEREST

Dr. John R. Black of Rochester was recently married to Miss Betty V. Hume of Anadarko, Oklahoma.

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Dr. William L. Mackenzie King of Rochester was married recently to Miss Marjorie Rean of Toronto, Canada.

* * *

Dr. M. M. Hursh, formerly of Grand Rapids and Cohasset, has opened offices in Hibbing for the practice of medicine.

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**Pharmacists are forbidden by law to refill narcotic prescriptions. Complaints have reached the Minnesota State Medical Association through the Minnesota State Pharmaceutical Association that some physicians are forgetful of this provision of the Minnesota Narcotics Law. Physicians must not expect druggists to refill prescriptions containing narcotics.**

Dr. H. S. Sherman, formerly of Plainview, has moved to Spring Valley, where he has opened offices for the practice of medicine.

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Dr. L. E. Prickman of Rochester was inducted into office as president of the local Kiwanis Club for 1939, at a meeting held on December 29.

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Dr. P. F. Sorum, formerly of Lumberport, West Virginia, has located in Jasper for the practice of medicine. Dr. Sorum is a graduate of the Rush Medical College in Chicago.

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Dr. Richard A. Bardon of Duluth has been named chief of staff of the Miller Memorial Hospital for the current year. Dr. Philip Eckman is vice chief-of-staff, and Dr. Harold Hoff, secretary-treasurer.

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Because agranulocytosis has been found to follow prolonged administration of amidopyrine containing drugs, the content of this drug in allonal has been replaced by three grains of acetophenetidin to the tablet.

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Dr. M. G. Gillespie of Duluth was elected chief of staff of St. Mary's Hospital at its annual meeting recently. The principal speaker at the meeting was Dr. M. B. Visscher of the University of Minnesota department of physiology, who spoke on "The Growing Importance of Physiology to the Practice of Medicine."

Dr. A. H. Field has recently become a member of the state hospital medical staff, Fergus Falls. A graduate of Marquette university medical school, Dr. Field interned at St. Joseph's hospital in Saint Paul and at Fairview hospital in Minneapolis. Dr. Albert A. Bodaski of Minneapolis has also joined the staff.

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Dr. A. M. Watson, who has been practicing in Royalton for thirty-four years, has taken his son, Dr. Sidney W. Watson, of Alexis, Ill., into partnership. Dr. Sidney Watson is a graduate of the Minnesota University medical school. He sold his practice at Alexis last fall where he had been located for more than four years.

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A symposium on the "Public Health Significance of the Virus and Rickettsial Diseases" will be presented by the faculty of the Harvard School of Public Health June 12-17, 1939. Lectures will occupy five mornings and clinics and demonstrations will be given each afternoon. A fee of $25.00 will be charged. Further information may be obtained by writing the Secretary of the School of Public Health, 55 Shattuck Street, Boston.

* * *

The American Board of Obstetrics and Gynecology announces that the general oral, clinical and pathologic examinations for all candidates, Part II Examinations (Group A and B), will be conducted by the entire Board, meeting in St. Louis, Missouri, on May 15 and 16, 1939, immediately prior to the annual meeting of the American Medical Association.

Application blanks and booklets of information may be obtained from Dr. Paul Titus, Secretary, 1015 Highland Building, Pittsburgh (6), Pennsylvania.

* * *

The Council on Physical Therapy of the American Medical Association has a number of films illustrating the value of physical therapy methods which can be borrowed for educational use by medical societies. These films illustrate certain methods used in muscle training, occupational therapy, underwater exercises, massage, and present the effects on circulation of heat and cold and massage.

In addition, films on the subject of syphilis, cancer, blood transfusion, the physiology of labor, pneumonia, and the treatment of burns, are obtainable.

These films may be obtained by writing to the Director of Exhibits of the American Medical Association, the only cost entailed being the cost of transportation.

* * *

The American Board of Ophthalmology announces an important change in its method of examination of candidates for the Board's certificate.

Examinations will be divided into two parts. Candidates whose applications are accepted will be required to pass a *written* examination which will be held simultaneously in various cities throughout the country approximately 60 days prior to the date of the oral examination.

The *written* examination will include all of the subjects previously covered by the practical and oral examinations.

*Oral* examinations will be held at the time and place of the meeting of the American Medical Association and of the American Academy of Ophthalmology and Oto-Laryngology, and occasionally in connection with other important medical meetings. The *oral* examination will be on the following subjects: External Diseases, Ophthalmoscopy, Pathology, Refraction, Ocular Motility, Practical Surgery.

Only those candidates who pass the written examination and who have presented satisfactory case reports will be permitted to appear for the oral examination.

Examinations scheduled for 1939: *written*: March 15 and August 5. *Oral*: St. Louis, May 15; Chicago, October 6.

Applications for permission to take the written examination March 15 must be filed with the Secretary not later than February 15.

Application forms and detailed information should be secured at once from Dr. John Green, Secretary, 6830 Waterman Ave., St. Louis, Mo.

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**U. S. Navy Medical Corps**

The Medical Corps of the United States Navy offers a number of internships and commissions to graduates of Class "A" medical schools who have completed or are about to complete an internship in a civilian hospital. Examinations will begin on Many 8, 1939, and applications should be on file at least one month prior to that date.

Qualified candidates who have completed internships in civilian hospitals and who successfully pass the competitive examination will be commissioned as Assistant Surgeons with the rank of Lieutenant (junior grade) and assigned to the Naval Medical School, Washington, D. C., for a postgraduate course of instruction prior to their assignment to sea or foreign shore duty.

Candidates must be United States citizens between the ages of 21 and 32 years at the time of appointment, and pass a physical and professional examination.

Officers of the rank of Lieutenant (junior grade) without dependents receive compensation of $2,699 per year, while those with dependents receive $3,158 per year. There are additional cash allowances.

If interested, write at once for further particulars to Bureau of Medicine and Surgery, Navy Department, Washington, D. C.

# REPORTS and ANNOUNCEMENTS

## MEDICAL BROADCAST FOR FEBRUARY

The Minnesota State Medical Association Morning Health Service

The Minnesota State Medical Association Broadcasts weekly at 11:00 o'clock every Saturday morning over Station WCCO, Minneapolis (810 kilocycles or 370.2 meters) and Station WLB, University of Minnesota (760 kilocycles or 395 meters).

*Speaker*: William A. O'Brien, M.D., Associate Professor of Pathology and Preventive Medicine, Medical School, University of Minnesota. The program for the month will be as follows:

February 4—Communicable Disease

February 11—Obedience in the Home

February 18—Physical Defects in Childhood

February 25—Children's Dentistry.

## STATE MEETING

The program of the Minnesota State Medical Association's 86th annual meeting is now complete, according to a report just issued by the Committee on Scientific Assembly.

The meeting will be held May 31, June 1 and 2, at the Minneapolis Auditorium with business sessions of the Council and House of Delegates scheduled on the evening of May 30 in advance of the meeting.

Internal medicine, surgery, obstetrics and gynecology, urology, dermatology and radiology will be represented on the scientific program with eight distinguished out-of-state speakers, as well as members of the association, to address the sessions. Scientific sessions will be confined, for the first time, to two days of program time, Friday, June 2, being devoted exclusively to the second Congress of Allied Professions dealing with public health and the public relations of medicine.

Round table luncheons will be a feature of the scientific sessions on Wednesday and Thursday, May 31 and June 1. A series of ten or more luncheons is being planned, each on a separate subject. Attendance at these luncheons will be limited to twenty each in order to facilitate informal discussion.

The annual banquet, scheduled for Thursday night, and also hotel headquarters for the meeting will be at the Curtis hotel.

Physicians from all of the nearby states will be invited to attend the meeting, which constitutes the only major medical gathering in the Northwest this year. Dentists, hospital administrators, nurses, technicians, welfare workers and all others who are in any way concerned with the delivery of medical services will be invited to the congress on Friday.

Members of the committee in charge of the program are: Dr. B. B. Souster, and Dr. Allen Wilson, Saint Paul; Dr. V. S. Counsellor, Rochester; Dr. F. H. Magney, Duluth; Dr. Charles Bolsta, Ortonville; Dr. B. O. Mork, Jr., Worthington; Dr. J. A. Myers, Minneapolis; Dr. W. A. O'Brien, University of Minnesota, Dr. George Earl, Saint Paul; Dr. J. M. Hayes, Minneapolis, and Mr. R. R. Rosell, Saint Paul. Dr. A. E. Cardle, Minneapolis, is chairman of the Committee on Local Arrangements.

## AMERICAN CONGRESS IN OBSTETRICS AND GYNECOLOGY

The first Congress of Obstetrics and Gynecology will meet in Cleveland, Ohio, September 11-15, 1939, and will be sponsored by the American Committee on Maternal Welfare, Inc., of which Dr. Fred Adair is chairman.

Sessions will occupy mornings, afternoons, and evenings of the five days of the Congress and various phases of the subject of human reproduction will be handled. This will include medical care from the standpoint of the general practitioner, specialist and educator, obstetric nursing, obstetrics from the standpoint of public health and the institutional administrator.

Those wishing to attend should communicate with the American Congress of Obstetrics and Gynecology Headquarters, The Annex, 650 Rush Street, Chicago, Illinois.

## BLUE EARTH COUNTY SOCIETY

Dr. G. A. Liedloff of Mankato was elected president of the Blue Earth County Medical Society for 1939, at the annual meeting of the Society held late in December at the Mankato Clinic. Dr. R. K. Edwards of Elysian was elected vice president, and Dr. C. A. Koenigsberger of Mankato was elected secretary.

## WASHINGTON COUNTY

At the January meeting of the Washington County Medical Society, Dr. D. Greth Gardiner of Saint Paul presented a very interesting lecture on bronchoscopy. The lecture was illustrated by x-ray plates on which the pathologic changes were clearly indicated and explained by Dr. Gardiner. After this lecture the Society indulged in comments on welfare work and the compulsory insurance which the federal government is trying to force upon us. Hospital insurance, both commercial and non-profit in character, came up for consideration, as did also the meeting at the Saint Paul Hotel on January 14.

## WINONA COUNTY SOCIETY

The annual dinner and meeting of the Winona County Medical Society was held on Monday evening, January 9, at the Hotel Winona.

About forty persons attended the dinner, which was

followed by a talk by Dr. Lewis G. Jacobs, roentgenologist at the Winona General Hospital, on "Therapy of Cancer of the Breast," and a talk by Dr. John Tweedy of Winona on "Chronic Abdomen and Its Relation to the Abdominal Triad."

Dr. R. L. Page of St. Charles was elected president; Dr. William Von Rohr Heise of Winona was elected vice president, and Dr. H. J. Roemer of Winona was elected treasurer. Dr. I. W. Steiner of Winona was re-elected secretary.

Members of the Auxiliary were entertained at dinner at the hotel, by the Society. Following the dinner, a meeting was held at the home of Mrs. Robert Tweedy. About fifteen members were present.

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## ST. JOSEPH CLINICAL SOCIETY

The St. Joseph Clinical Society, St. Joseph, Missouri, will hold its eighth annual spring clinic on March 28 and 29, at the Hotel Robideaux, St. Joseph, Mo. There will be no registration fee. The purpose of the meeting is to offer a concentrated post-graduate course in recent advances in clinical medicine and surgery as interpreted by eminent clinicians who will be guest speakers. Over sixty such guest speakers have already honored the society in the past. This year's speakers offer an especially attractive series of clinical lectures.

Aware of the ever increasing importance of more recent social trends as they affect organized medicine, the committee has secured Dr. Morris Fishbein, who will deliver an address to which the general public will be invited. Two luncheons and banquets will be reserved for relaxation and entertainment.

Among those taking part in the program are the following:

Dr. Gershom J. Thompson: "Transurethral Prostatic Resection."
Dr. Q. U. Newell: "Cancer of the Uterus."
Dr. Fred J. Taussig: (Round Table Discussion) "Treatment of Septic Abortion."
Dr. F. J. Taussig: "The Coördination of Radium with Surgery in the Treatment of Cervix Cancer."
Dr. Willis C. Campbell: "Some Aspects of Surgery of the Hip Joint."
Dr. Heyworth N. Sanford: "Jaundice in the New Born."
Dr. Heyworth N. Sanford: (Banquet) "Some Observations on Disturbances of Blood Coagulation."
Dr. August A. Werner: "The Effect of the Ductless Glands in Growth and Development."
Dr. Ralph A. Kinsella: "The Pneumonias."
Dr. Walter C. Alvarez: "Useful Hints in the Treatment of Indigestion."
Dr. Maurice C. Howard: "Problems of Gastric Hemorrhage."
Dr. Morris Fishbein: (Noon Luncheon) "American Medicine and the National Health Program."
Dr. Morris Fishbein: (Open Public Address) "The Social Aspects of Medical Care."
Dr. J. A. Myers: "Modern Methods in Diagnosis and Therapy of Tuberculosis."
Dr. Coyne H. Campbell: "Practical Points in the Management of Neurotic Symptoms, Inhibitions and Anxiety."
Dr. Manuel Grodinsky: "Pyogenic Infections of the Hand and Foot."

The St. Joseph Clinical Society extends a cordial invitation to all members of the medical profession who may wish to be guests at this clinical gathering.

## WOMAN'S AUXILIARY

MRS. W. B. ROBERTS, Minneapolis, *President*
MRS. E. V. GOLTZ, 2259 Summit Avenue, Saint Paul, *Publicity Chairman*

The Women's Auxiliary of the Olmsted-Houston-Fillmore-Dodge County Medical Society met at 8 P. M. January 4, at the Mayo Foundation House, Rochester. Edward H. Weld, Jr., described health insurance plans being tried in various localities. About twenty-five members were present. Following the talk by Mr. Weld, Mrs. H. C. Habein, president, showed colored motion pictures of England which she had taken on her recent trip abroad. Refreshments and a social hour followed.

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Mrs. M. L. Hershfield of Duluth, state parliamentarian, was a guest of Mrs. Wm. B. Roberts, state president, in Minneapolis, January 6 and 7.

* * *

Mrs. A. A. Passer, member of the Advisory Committee, was a guest in the Twin Cities, January 9 and 10.

* * *

The second State board meeting will be held in Saint Paul, Wednesday, February 1. Mrs. E. M. Hammes of Saint Paul is the social chairman for the event and Dr. George A. Earl will address the group. Mr. F. M. Brist will be the guest speaker.

* * *

The Women's Auxiliary of the Ramsey County Medical Society announce that they cleared $1,500 from the play "The Dream of a Clown" which they sponsored December 16 and 17, in the Saint Paul Auditorium. Much credit is due those members who contributed their energy and time for the success of this undertaking.

The Ramsey County Auxiliary will present cups to the two winners of essays which were chosen during the recent tuberculosis campaign at the regular meeting of the group, January 23. The winners who will read their essays for the organization are Eileen O'Keefe, a pupil of the Visitation Convent, and Clinton Marshall, a pupil of John Marshall High School. The title of the essays is "Tracking Down the Foe of Youth—Tuberculosis."

The Red Cross Society has announced that the Ramsey County Medical Auxiliary led all other organizations in the selling of Red Cross subscriptions—based on the percentage of the amount over the quota given to sell. Mrs. J. A. Moga, assisted by her committee, made 133 per cent over their quota in the booths in the Lowry Medical Arts Building.

## PROCEEDINGS OF THE MINNESOTA ACADEMY OF MEDICINE

### Meeting of November 9, 1938

The regular monthly meeting of the Minnesota Academy of Medicine was held at the Town and Country Club on Wednesday evening, November 9, 1938. Dinner was served at 7 o'clock and the meeting was called to order at 8:10 p. m., by the President, Dr. R. T. La Vake.

There were sixty members and one guest present.

Minutes of the October meeting were read and approved.

The proposed amendment to Article III, Section 1, of the Constitution, making possible an increase in University Membership from five to ten members, was voted on and carried.

The scientific program consisted of five case reports as follows:

## ACUTE FATAL CORONARY THROMBOSIS WITH GALLBLADDER SYMPTOMS

### Report of Case

CHARLES N. HENSEL, M.D.
*Saint Paul*

Mrs. C. R. C., aged fifty-five; former occupation, nurse; married eight years; childless; entered Miller Hospital, Saint Paul, February 10, 1938, and died on February 22, 1938.

On entering the hospital her chief complaints were heartburn, intense pain in upper right quadrant, nausea and vomiting.

She had had polyarthritis at the age of thirty-four followed by mitral valvulitis and stenosis, with recovery. She was a nurse in the Veterans' Bureau from 1921 to 1930. Appendectomy in 1924. No history of gallbladder disease. She was in Miller hospital in 1932 for three months with congestive heart failure following coronary occlusion, making a good recovery. Blood pressure varied from 170/100 to 135/85. Radiograph of the heart at that time showed a universal enlargement, particularly to the right, prominence of pulmonary conus, bulging of left auricle into the mediastinum as disclosed by barium meal in gullet. Total transverse diameter was 15.2 cm.—52 per cent of chest diameter. The patient was fairly active after leaving the hospital, with occasional attacks of auricular fibrillation and mild congestive heart failure relieved by bed rest and cardiac tonics.

History preceding present recent admission to the hospital: On January 28, 1938, she was seen at the office because she was greatly agitated over the recent death of two dear friends and the possibility that she might be involved in litigation of the will of one of them in which she was a beneficiary. Blood pressure at that time was 184/90, heart rate 72, rhythm regular, presystolic murmur at apex and a snapping pulmonic second.

On February 7, 1938, she was seen at home complaining of intense heartburn for the past seven days. This was described as a pressure pain or a burning sensation at the tip of the sternum at the right costosternal margin. The heart showed no changes in rate, force or rhythm. Blood pressure, 156/98. Lungs clear. Abdomen soft and pliable. No tenderness in the region of the gallbladder. Temperature was normal. Her condition was considered not serious. Antacids and antispasmodics were prescribed. Two days later (February 9) the patient 'phoned that she felt relieved and would go through with a dinner party that evening as planned.

The following day (February 10) she was seen at home propped up in bed, rocking back and forth in great distress, still complaining of burning pain at the tip of the sternum and along the right costal margin. She had vomited all night long. On examination, the lungs were negative, heart showed no abnormalities in rate, force or rhythm. The gallbladder region gave some tenderness and some muscle spasm on examination. She was sent into the hospital for studies of the gallbladder. The heart was not considered to be the source of symptoms.

Radiographs of the gallbladder showed a large, flaccid gallbladder, tortuous in outline, good density but sluggish in emptying; no stone shadows. Sedimentation rate—1 hour, 52. Urine showed a trace of albumin and no sugar. Hb. 76 per cent, r.b.c. 4,220,000, w.b.c. 12,100.

On February 12, Dr. Zimmermann saw the patient in consultation—the condition not considered surgical, might be due to heart. The patient was fibrillating at the time of examination. She was still complaining of epigastric pain, nervous and very emotional.

On February 14, her condition became critical, pulse imperceptible, blood pressure 82/64, electrocardiograph, auricular flutter 2-1. In an oxygen tent there was sudden collapse, convulsive movements, and the patient became unconscious. Death was imminent. The patient became cold all over, occasional gasping, heart tones feeble, rhythm regular, rate 100. After about three-quarters of an hour in this condition the patient began to breathe normally, opened her eyes, and remarked, "I think that I have died; I cannot see; I cannot move my arm." She had a flaccid paralysis of the right arm and was blind although examination of the eye grounds was impossible due to contraction of the pupils.

From February 15 to February 22, 1938, the patient was unable to retain nourishment by mouth, in a state of marked mental agony asking to die, asking for relief, asking for opiates (which were given freely without calming effect). The patient thrashed and threw herself about, became increasingly dyspneic and cyanotic, heart rate rapid, rhythm irregular, tones feeble, pulse barely perceptible. Blood pressure 76/60. First elevation of temperature on February 16 at 99°, rose to 101° at death. Leukocytes 24,000 to 34,000. As her heart failed, the urine showed increasing amounts of albumin and hyalin and granular casts. On February 17 the blood sugar was 111 mgm. Coma developed on February 20. The patient expired on February 22 and an autopsy was obtained.

*Autopsy.*—Chief findings in heart: Weight 450 grams. The epicardium is rough and covered with flakes of fibrin. The pericardial sac contains about 15 c.c. of thick, purulent fluid. The myocardium is dark red in color, fairly firm in consistency. The left ventricle is 1.5 cm. thick. Along the course of the anterior descending branch of the left coronary are seen numerous white patches of fibrosis in the heart muscle. Along the posterior branch of the left coronary are seen grayish green areas of infarction extending into the interventricular septum. The endocardium is smooth and free from thrombi. The mitral valve is thickened and fibrous. A fairly firm vegetation about 5 mm. in diameter is found at the periphery of the valve. The remaining valves are normal. The root of the aorta

shows a smooth intima. The coronary arteries are markedly sclerotic throughout. The lumen of the left coronary is considerably narrowed. Two centimeters from the orifice of the left coronary artery the lumen is practically occluded by a thickening of the wall and a fairly soft coagulum which was probably terminal.

Findings in the gallbladder were normal.

*Comment.*—This is a case of diffuse coronary sclerosis with an area of fibrosis from a healed infarct (1932). Progressive occlusion of the smaller branches of the posterior portion of the left coronary artery resulting in a patchy infarction, all recent, *i.e.*, from a few days to within three weeks, undoubtedly accounting for the burning pain in the epigastrium. Examination of the head was not permitted, but the finding of a fresh vegetation in the mitral valve explains the convulsive attack, blindness, paralysis of the right arm occurring a week before death.

## LACERATIONS OF LARGE AND SMALL INTESTINE WITHOUT PERFORATION

### Report of Case

A. W. Ide, M.D.

*Saint Paul*

This patient is a young man, eighteen years old. He was employed as a machinist apprentice in a railroad shop and was injured October 8, 1938, at 9 o'clock in the morning.

In the shops, where he was working, a locomotive drive wheel was being moved by means of a power hoist. This wheel was resting on the floor of the shops but held in a nearly upright position by means of chains attached to this hoist. The wheel was not directly upright but was leaning slightly to one side. In the course of the work, the position of the wheel was changed and it was tipped toward the other side. As the wheel tipped, it struck this patient in the lower abdomen. The wheel had nearly reached its permanent position before the blow was struck so that the blow was not apparently very severe. It was, however, sufficient to immediately cause the patient very severe pain in the lower abdomen. He was immediately brought to the hospital in an ambulance.

On examination, the patient appeared to be a normal young man in very acute pain. The abdominal muscles were relaxed except on the left side, where there was a moderate degree of rigidity. There was great pain in the lower abdomen on the left side and near the iliac crest. The patient's general appearance and complaint gave one the impression that he had sustained a severe bone injury in this region. There was some vomiting. He was given a hypodermic injection of a quarter grain of morphin sulphate on admission and another sixth of a grain of the same drug two hours later. The morphin relieved the pain somewhat but the patient did not sleep. He still complained bitterly of pain and localized this pain in the region of the lower abdomen.

A catheterized specimen of urine showed no blood or other abnormality. A blood examination showed 85 per cent hemoglobin, with 4,270,000 red blood cells and 8,900 white blood cells. The temperature was normal. The pulse rate on admission was 86.

About three hours after the injury he began to develop rigidity of the abdominal muscles and at 3 p. m., six hours after the injury, the abdomen was boardlike. A diagnosis of perforation of the bowel was made and operation was advised.

A left rectus incision was made. There had been some bleeding in the abdominal cavity but it was not at all extensive. Lacerations of the bowel were found as illustrated (Fig. 1). There was one laceration in the lower sigmoid, 3 inches in length and 1.5 inches in width. The outer coats of the bowel were torn

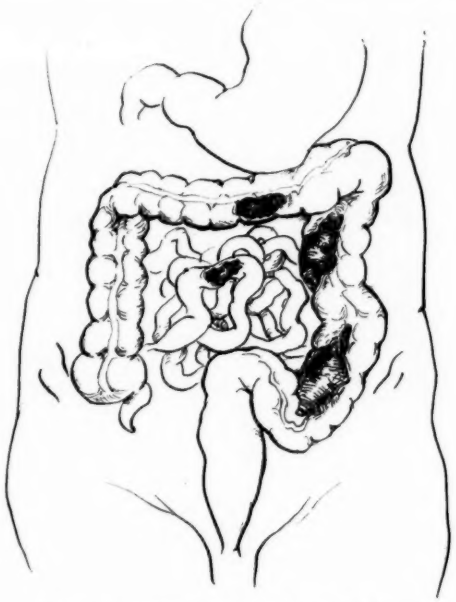

Fig. 1. Lacerations of the large and small intestines without perforation.

but the mucous membrane was still intact. There was another laceration just below the splenic flexure. This was 2 inches in length and 1 inch in width. There was another laceration about midway in the transverse colon and there was a similar laceration of the small bowel. The lacerations were repaired. There was no sign of bowel content in the peritoneal cavity and no actual perforation could be found in the regions of laceration. General exploration of the abdominal cavity was made but no further injury could be found.

The abdomen was closed without drainage and the patient has made an uninterrupted recovery.

*Comment.*—This case was interesting to us primarily because of the fact that the patient developed signs of perforation of the bowel when no actual perforation was present. The lesions consisted of multiple lacerations of the bowel without perforation. There were no injuries to the other abdominal organs and there were no injuries to any bones.

# CONGENITAL UNILATERAL RENAL AGENESIA

## Report of Case

MARTIN NORDLAND, M.D.
*Minneapolis*

The case is that of a female patient, sixty-four years of age, married, who, on December 2, 1937, was taken ill with a pain in the upper abdomen. She stated that it came on shortly after she ate her Sunday dinner. The pain lasted during that day and the following night but was not sufficient to keep her awake. She was not nauseated. She had two stools before retiring, which was unusual. For the next two days she was fairly well relieved with a hot water bottle. Although she was not very ill, she called a physician on the third day because the pain, which had localized in the right lower abdominal quadrant, had not entirely subsided. She entered the hospital with a diagnosis of appendicitis.

On admission her temperature was normal, pulse was 90, and hemoglobin 93 and 95 per cent, N & D. The leukocyte count was 49,900, which was checked. Red cells numbered 5,060,000. The differential whites were: small lymphocytes, 5.5; large monocytes, 11.5; and polymorphonuclears 80 per cent.

The urine was reported to have an orange color, cloudy appearance, acid reaction and specific gravity 1.033. There was a large trace of albumin and no sugar. There were no casts and the microscopic field was obscured by bacteria. On the following day the color of the urine changed to straw, it was clear, still had a large trace of albumin, no casts and the microscopic examination showed 6 to 10 pus cells per high-power field and 1 to 4 red blood cells. The third specimen, on the succeeding day, showed urine straw colored and clear, still a large trace of albumin, no casts and 100 to 150 pus cells per high-power field and 60 to 80 blood cells.

The leukocyte count in the three days after admission dropped from 49,900 to 40,000, 28,000 and 18,400.

The patient was a rather slender individual, moderately well nourished, and during the four days following her admission the physical examination was essentially negative except for the presence of a firm mass which seemed to fill the right abdomen down to the level of the right anterior superior spine. There was no rigidity but there was a slight spasticity of the right rectus muscle. The mass seemed a little irregular and was only a little tender. There was considerable pain over the right kidney region, posteriorly. On account of the "orange" color of the first specimen of urine examined, the urinalysis referred to above and the high leukocyte count, together with the pain in the region of the right kidney, a tentative diagnosis of surgical lesion of this kidney was made.

Plates were made of the urinary tract and the roentgenologist's report was as follows:

> "These show the outline of the left kidney clear. This is not enlarged. The outline of the right kidney and *right psoas shadow is obscured.* There is no evidence of urinary stone. Plates made after the injection of diodrast show the pelvis and calyces of the left kidney and left ureter to be well outlined. There is no excretion of the dye from the right side.
>
> "Conclusions: The right kidney outline is not visualized. The *right psoas muscle is not visualized.*
>
> "Following the dye, we can demonstrate the kidney and ureter on the left side. No conclusions can be drawn from the right side except that the right kidney is not functioning at this time."

Two days later a cystoscope was introduced and exploration of the bladder revealed the absence of a right ureteral orifice. The left ureteral orifice was observed, slightly prolapsed. The bladder was otherwise normal. Spurts of clear urine came at regular intervals, about every five seconds, from the left ureteral orifice. Indigo carmine was introduced intravenously. Function was normal on the left but nothing appeared on the right and further search revealed complete absence of the right orifice.

Ten days after admission, the patient was comfortable, without temperature, leukocyte count 14,500 and the urine, which was clear and straw colored, showed only a trace of albumin with only 5 to 10 pus cells and no red blood cells per high-power field. The mass described was still present.

Preoperatively, it was felt that the mass could be reached best through the abdomen anteriorly, but, because of the possible presence of pus, we felt that it was best to approach it through an extraperitoneal kidney incision. Exploration revealed no evidence of the kidney or a congenital residue. The peritoneum was opened and we found we were dealing with a huge gallbladder. The liver border was at the level of the iliac crest and the fundus of the large gallbladder (7 inches in length) extended into the pelvis. Adhesions of recent origin were present between the gallbladder and the parietal peritoneum over the ileopsoas muscle. A portion of the duodenum and the cecum were attached to the anterior surface of the gallbladder. There was a large amount of exudate on the parietal peritoneum adjacent to the attachment of the gallbladder. The gallbladder, which was tense, markedly thickened and which contained numerous stones of various sizes, was easily removed through the excellent exposure of this incision.

The case was thought to be of interest because of the difficulty of the preoperative diagnosis, because of the congenital absence of the right kidney, and because of the ease with which this large gallbladder could be removed through the unusual approach of a kidney incision.

Collins, in a discussion of congenital unilateral renal agenesia in 1931, stated that review of the literature revealed 572 cases. At that time nine additional cases were added from the Section on Pathologic Anatomy of the Clinic. Braasch stated that congenital absence of the kidney was probably not of great clinical significance but that a clinical diagnosis of agenesia would be impossible. Only the circumstances as existed in this case or a postmortem examination would ascertain this condition. He further stated that the value of Dr. Collins' data, other than being a contribution to renal pathology, lay in the fact that it emphasized the occurrence of solitary kidney.

### Discussion

DR. W. F. BRAASCH, Rochester: The clinical recognition of renal agenesia is not as rare now as it used to be. Since the advent of excretory urography, solitary kidneys are discovered rather often. Just because only one kidney is visualized in the excretory urogram, however, does not necessarily infer that the other kidney is absent because of agenesia. It must first be proved that the absence of renal function is not temporary and the result of a remediable cause. If the kidney is absent, one must determine whether the condition is congenital or acquired. The diagnosis of congenital absence of the kidney, or renal agenesia, can be made from the original roentgenograms because of several data. The outline of the congenital single kidney is much larger than that of the acquired single kidney and its position is much lower. Finding the kidney shadow on one side only, especially if the renal shadow is very large and is situated very low, would, in most instances, be very suggestive of renal agenesia.

The absence or dimming of the psoas shadow on the side of the absent kidney, with accentuation of the psoas on the other side, is often observed in the roentgenogram. I don't know why the psoas shadow should be diminished. I asked Dr. Scammon for information about this, but he was unable to give me any. Possibly it is caused by a failure of development of renal innervation and branches supplying the psoas muscle. Sometimes the psoas shadow on the side of the absent kidney is very broad and well developed. Corroborative evidence of agenesia is often derived from the cystoscopic examination. The interureteral ridge on the side of the absent kidney is usually undeveloped and the ureteral orifice is absent. Having the data available from the original roentgenogram and from the excretory urogram, if the psoas shadow on the side of the absent kidney is faintly visible and accentuated on the other side, one should be able to recognize renal agenesia in most cases.

DR. F. E. B. FOLEY, Saint Paul: The title of this case report, "Renal Agenesia," is a misnomer. Obviously the gallbladder condition was the important thing with the renal anomaly merely an incident. This, however, does not detract from the interest of the latter. The condition was important in the diagnosis in this case and particularly so in being misleading.

Renal agenesia or congenital absence of the kidney not infrequently comes up for consideration in diagnosis. The condition exists in two forms. In one the congenital defect is primarily in the renal blastema. In that case a ureteral bud forms from the Wolffian duct and develops into a normal ureteral orifice and ureter of some length. Because of aplasia or absence of the renal blastema the kidney proper does not develop and the ureter ends blindly. In this event there is congenital absence of the kidney combined with a normally formed trigone, presence of both ureteral ridges, both ureteral orifices and on one side a ureter of some length ending blindly. In the second form of the condition of which this case is an example the congenital defect is primarily in the Wolffian duct. It fails to form a ureteral bud and no ureter develops. Even if the blastema is present it receives no ureteral bud and in consequence does not develop a kidney. In this form of the anomaly one side of the trigone, the ureteral ridge, orifice and ureter and kidney are all absent.

## CHRONIC CONSTRICTIVE PERICARDITIS WITH CALCIFICATION

### Report of Case

MOSES BARRON, M.D.
*Minneapolis*

The case I am presenting this evening is one that was sent to me with the diagnosis of heart disease. The patient had been treated for this condition for several years and had become bedridden during the previous six months. This type of case presents all the symptoms and findings of congestive heart failure but may also be confused with cirrhosis of the liver. An exact diagnosis was absolutely essential for the proper management of this case, since she did not respond to the usual medical management and required surgical interference, before any improvement was obtained.

A woman, aged forty-five, married, was first seen on August 15, 1938. She came in complaining of swelling of the abdomen of two years' duration, weakness of one year's duration, loss of weight, inconstant edema of the legs, and with symptoms so severe that she had been confined to her bed for six months.

Past history: In 1925, at the age of thirty-two, she had scarlet fever. During convalescence she developed acute rheumatic fever which laid her up for two months. She thinks that at that time her heart became involved. Following this she felt tired and noticed dyspnea on exertion. About a year later she was in an auto accident when her chest was crushed. She was taken to a hospital where she was told she developed pus around her heart, that is, a suppurative pericarditis. She stayed in the hospital only five days, when she was sent home. Her recovery was slow. Finally, she felt quite well again. She performed her usual duties until about two years ago, when she noticed progressive weakness and enlargement of the abdomen. Later she noticed her ankles would swell while she was up and around. She developed a peculiar pressure sensation in the chest which, together with the shortness of breath, made it difficult for her to talk at times. The abdomen began to swell and became so large that, in February, 1938, paracentesis was performed, when eight quarts of clear fluid was removed. This was repeated in June and an equal amount of fluid was withdrawn. She had been confined to her bed since the first paracentesis. During the past year she was given salyrgan and digitalis with very little if any relief. She had to be careful with her diet because many foods produced gas, belching and bloating. She had had a number of attacks of pain in the right upper quadrant which was diagnosed gallbladder disease about ten years ago. She has been free from these attacks lately.

Physical examination: The patient was 5 feet 3 inches tall, weighed 124 pounds, pulse 74, blood pressure 110/80. There was a slight edema of the lower back. The heart was apparently not enlarged, tones faint and impure, the pulse small and irregular, the heart was fibrillating. There were pulsations in the vessels of the neck, more on the right. The lungs were clear. The abdomen was large and presented all the evidence for the presence of a large amount of free fluid. The liver came down about 5 cm. below the costal margin, the edge was firm. Pelvic examination was negative. The blood showed Hb. 80 per cent, 8,600 leukocytes, with normal differential; Wassermanns were negative. The urine was negative. An electrocardiogram showed low voltage in all the leads, $T_1$ isoelectric, $T_2$ and $T_3$ slightly negative. There was slight slurring of the QRS in the second and third leads. Tracings were taken in three positions: with the patient on the back, on the right side and on the left side. All the tracings appeared alike, with practically no change in the different positions and presumably no shifting in the cardiac axis. A 6-foot heart radiograph showed the heart in midposition with marked calcification of the pericardium. It appeared as if the heart were enclosed in a calcium shell. The lateral film showed this even better than the antero-posterior view. Venous pressure showed a definite increase to 20 to 25 cm. of water in the antecubital vein (normal 5 to 8 cm.). There was a florid cyanosis. The diagnosis was constrictive pericarditis with advanced calcification.

*Comment.*—This patient presents very important findings for diagnosis. The ascites and the enlarged liver may suggest cirrhosis of the liver. However, there is a negative history of alcoholism and there was a marked dyspnea on the slightest exertion which is not common in cirrhosis. The increased venous pressure was definitely against such a diagnosis, if uncomplicated, as was also the electrocardiogram. The x-ray findings helped to rule out cirrhosis of the liver and establish the true diagnosis. The question of conges-

tive heart failure came up for consideration but the marked increase in venous pressure in spite of the absence of cardiac enlargement pointed strongly against it. Such a combination is extremely rare in congestive heart failure. Another finding against such a diagnosis is the absence of evidence of pulmonary congestion in the presence of marked dyspnea on the slightest exertion.

In résumé, then, the essential findings for the diagnosis of constrictive pericarditis in this case were the increased venous pressure without cardiac enlargement, enlargement of the liver with marked ascites, dyspnea without evidence of congestion of the lungs, marked weakness, diminished apical impulse, low pulse pressure, fixation of the heart as found by physical examination as well as by fluoroscopy and electrocardiogram, and the finding of calcification of the pericardium. The condition may be described as "inflow stasis." An insufficient amount of blood is able to enter the heart chambers, which results in a diminished output. A similar condition is often brought about mechanically by severe tricuspid stenosis. In these cases the x-ray examination is exceedingly important. Fluoroscopic evidence of the absence of pulsations at the cardiac borders is very characteristic. In the present case the x-ray examination showed, in addition, the extensive calcification of the pericardium.

*Treatment.*—Medical management offers very little lasting relief in these cases. In only a few cases, where there may be some associated congestive heart failure, does digitalis prove of value. The only procedure which holds out promise for extensive relief in the majority of cases, and perhaps a practical cure in about one-third of the cases, is surgical interference. Decortication has proved to be life-saving in a large series of cases reported by many authors. The present case was referred to Dr. Owen Wangensteen of the University for surgical treatment. On August 23, 1938, Dr. Wangensteen operated under intratracheal anesthesia. The postoperative course was satisfactory and the patient was discharged from the hospital on September 10. She returned for a checkup the latter part of October. At this examination she was able to be up and around, with very little dyspnea. The ascites had completely disappeared so that the abdomen was flat. The patient said that she now feels well except for some weakness. However, the venous pressure is still above the normal. The x-ray now shows that the heart has now enlarged to the left, and that the left border has fair excursion. It is very likely that a secondary operation may have to be performed to relieve the right auricle and ventricle, which could not be done at the first operation. The improvement up to now has been most striking. Dr. Wangensteen will discuss the surgical phase of this type of case.

## Discussion

DR. O. H. WANGENSTEEN, Minneapolis: I am grateful to Dr. Barron for the privilege of participating in the care of the patient whose condition he has discussed. He recognized the nature of the disorder. The disturbance having been identified, determination of the proper therapy was but a natural sequence.

Before discussing the surgical aspects of constrictive pericarditis, I should like to emphasize the physical criteria mentioned by Dr. Barron by which the disorder may be recognized. A high venous pressure as indicated by prominence of the jugular and antibrachial veins at heart level and a low arterial pressure and a small pulse characterize the condition. The apex beat may not be felt with the hand and fluoroscopically the limited motion of the heart is striking. The heart may appear small on a roentgenogram, but fluoroscopic visualization is more revealing. If saline solution is allowed to run from a glass tube into an arm vein with the arm at the level of the right atrium, the height at which the column of fluid comes to a standstill determines the venous pressure. These findings are the same whether tamponade of the heart is occasioned by blood, fluid or pus in the pericardial sac or by a thickening of the pericardium limiting and restraining the motion of the heart.

In 1898 the French surgeon Delorme[1] suggested that an operation might be done for constrictive pericarditis in which the thickened pericardium is divided and stripped from the heart muscle. He did not then do the operation, however. In 1902 Brauer[2,3] suggested that the ribs and cartilages overlying the heart be removed in those instances of constrictive pericarditis in which there was retraction of the chest wall in cardiac systole. Only those patients in whom adhesive bands from the pericardium attach to the anterior chest wall causing a tug on the chest wall during systole of the heart would be helped by such a procedure. In instances which meet the operative indication it probably would be well to take measures to preclude reformation of bone from the periosteal rib beds and the perichondrium. It is quite obvious, however, that the Brauer operation would be of no avail in the presence of constrictive pericarditis. The younger Rehn[4,5] was the first to do the operation suggested by Delorme some years before. It was, however, the conjoint effort of the internist Volhard and the surgeon Schmieden which established the practicability of the Delorme operation in the relief of constrictive pericarditis.[6]

I believe I am correct in saying that Churchill of Boston was the first in this country to operate successfully for the relief of this condition and that as recently as 1929.[7] The success with which Churchill has dealt surgically with the condition of bronchiectasis, establishes him as one of the keenest exponents of thoracic surgery in the world. He has reported recently[8] a group of eighty-four cases of bronchiectasis for which he did lobectomy with a mortality rate of 4.7 per cent. There was only one death in the last sixty-six cases —a really remarkable achievement when one appreciates the potentially formidable character of the operation.

In the aggregate, there must now be on record somewhere in the neighborhood of a hundred cases of constrictive pericarditis which have been treated successfully by operation. Schmieden's series has grown to twenty-two in number.[9] In this country Beck at Cleveland,[10] Churchill at Massachusetts General Hospital,[11] Blalock at Vanderbilt,[12] and Heuer at Cornell,[13] have each had a unique surgical experience with the condition. Harrington reports a successful instance in the current issue of the Mayo Clinic bulletin.[14]

As Schmieden has pointed out[15] the decortication should begin over the left ventricle. The right ventricle, of course, after opening the chest wall through a left para-sternal incision comes into view most quickly. If it be decorticated first the inflow stasis of peripheral vascular inadequacy to which the patient has in part accommodated himself may then be replaced by pulmonary edema—a tragic occurrence which Schmieden encountered in one of his early cases. Preliminary decortication of the left ventricle will permit it to deal with the restraint to "inflow stasis" which will accompany decortication of the right ventricle.

Both Schmieden and Churchill warn that attempts should not be made to remove scar from the thin atrial walls. The dissection must stop in the auriculoventricular grooves. Care, however, must be observed to see that the heart is loosened from the diaphragm inferiorly.

In the instance of Mrs. E. J., aged forty-five years, University Hospital No. 671539, reported by Dr. Barron, the pericardium was calcified and the heart encased in a stony, hard mould. The pericardium could not be cut with scissors or knife, but had to be trimmed away with bone shears. I decorticated the entire left ventricle and the anterior portion of the right. It is important to adapt the operation to the patient and not do too much at one sitting. It is noteworhy nevertheless that Schmieden completed all but one of his twenty-two operations in one stage. As Dr. Barron indicated, this patient has improved astonishingly. She left the hospital somewhat less than three weeks after the operation without evidence of edema or ascites and is still edema and ascites free. There is some slight residual evidence of fluid in the left pleural space, but this, I believe, is incident to the opening of the pleura at operation. Despite the fact that this patient appears clinically well, the presence of an elevated venous pressure (still 20 cms. of saline solution) indicates that it probably would be wise to remove the calcified pericardium from the entire right ventricle.

A prior experience with another patient suggests this also. Two years ago I removed the greater portion of the constricting pericardium from Mr. C. R., aged forty-two years, University Hospital No. 650540. He improved slowly, and the consideration of another operative procedure carried out through an incision in the right thorax was debated. Because of the technical difficulties of establishing the plane of cleavage between the thick pericardium, in the lamination of which encysted fluid had accumulated, and the epicardium, subsequent operation was deferred and the patient dismissed from the hospital. Three months later when he returned his condition was such that reoperation was out of the question.*

Constrictive pericarditis is a disorder which should be recognized readily. It is by no means a common condition. Surgery in suitable cases offers a direct and dramatic means of terminating heart failure and invalidism.

DR. W. H. CONDIT, Minneapolis: What takes the place of the pericardium?

DR. WANGENSTEEN: A number of persons, Doctors Fahr, Sperling and myself among others,* have removed the entire pericardium in dogs and observed that the capacity of such dogs for work on the treadmill was equal to that of normal animals. Useful as the pericardium may be in preventing acute cardiac dilatation, it is not an indispensable membrane, for dogs seem to get on quite well without it.

DR. F. R. WRIGHT, Minneapolis: Has the patient gained anything? What has been accomplished by it?

DR. BARRON: The records from the literature show that 50 per cent of the cases are practically cured, even though not able to do any hard work. This patient is able to work around the house as long as she doesn't hurry. It has been about eight weeks since operation. If you could see that patient and see how comfortable she is, one would think the operation is worth while. There is still some constriction around the large vessels.

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*Since presentation of this paper a third patient with constrictive pericarditis has been operated upon (L. G., aged eleven years, University Hospital No. 639977). Diuresis following pericardiectomy was striking. The operation was performed November 25, 1938, and the patient is still in hospital convalescing.

## PRIMARY CARCINOMA OF THE URETER

F. E. B. FOLEY, M.D.
*Saint Paul*

The case to be reported is of unusual interest because of the rarity of the condition it presents, the classical clinical features it showed including particularly a deformity in the pyelo-ureterogram characteristic of the condition and because of the particular form of operation employed. For the sake of brevity only essential details will be set forth.

A spinster, sixty-nine years old, was referred to me by Dr. Lepak on June 15, 1938, because of blood in the urine. Two weeks before Dr. Lepak referred her to me she had consulted him because of dizziness. Two days later she noted that the urine was colored with blood. Hematuria had never occurred before and she attributed it to drugs prescribed by Dr. Lepak. Hematuria was present with every urination from noon until going to bed at night. Following this there was no recurrence of gross hematuria. Dr. Lepak reported that the drugs prescribed could not be responsible for the hematuria. Dr. Lepak examined specimens of urine on several subsequent days. He found none of them grossly colored with blood but found in all of them a considerable number of red blood cells on microscopic examination.

On close inquiry in regard to pain suggestive of renal origin there was an account of a fall and striking the lower ribs on the right side followed by periods of slight pain and tenderness in this region ever since. The description of the pain, its character and location were not strongly suggestive of upper urinary tract origin.

There was no reaction to Murphy percussion on either side, there was no tenderness to deep bimanual pressure in either flank and neither kidney was palpable. No mass or tenderness could be made out in the abdomen. Well up in the vaginal vault on the right side lying close to the bladder wall and extending over to the pelvic wall, very definite induration and firmness could be felt. Apart from this the findings of the physical examination were negative. The urine was clear and the findings of the urine examination were all normal except for the presence of six red blood cells per high power field in the centrifuged specimen. The urinary tract radiograph gives a good outline of each kidney, the left being of normal size, configuration and position while the right is of decidedly smaller than normal size and rather low-lying. There is a small irregular shadow overlying the right margin of the sacrum remotely suggestive of ureteral stone.

The cystoscopic examination disclosed a perfectly normal bladder interior. A ureteral catheter ascended the left ureter against no abnormal resistance while on the right side an F6 ureteral catheter encountered strong resistance beginning 4 cm. above the orifice. Only by splinting the catheter with a wire stilet in its lumen could it be further advanced. Using some little force it ascended to the renal pelvis. Only 1 or 2 c.c.

of urine could be aspirated from the catheter in the left ureter while aspiration of the catheter in the right ureter obtained 30 c.c. of urine. Indigo-carmine given intravenously appeared promptly in good concentration in the urine dripping from the left catheter. At the end of 10 minutes the dye had not appeared in the urine dripping from the right catheter.

The bilateral pyelo-ureterogram is shown here. The calyces, pelvis and ureter on the left side are all quite normal. On the right side there is a grade 2 dilatation of the pelvis and calyces with the pelvis of rounded bulging type. The bulging pelvis overlies the ureteropelvic junction, which is not visualized and leaves unanswered the question of uretero-pelvic junction obstruction. The ureter is dilated grade 2 from the kidney down to a point 6 or 8 cm. above the bladder. From here down to the bladder there is an irregular distribution of the contrast medium in the form of irregular tangled streaks not outlining definitely a ureteral lumen. The deformity is strongly suggestive of ureteral neoplasm with the ureteral lumen occupied by irregular soft papillary growth. The small irregular shadow overlying the right margin of the sacrum is outside the ureter and the possibility of it representing a ureteral stone is definitely excluded.

For consideration in diagnosis the salient features were:

1. The history of gross hematuria.
2. Long continued presence of red blood cells in the urine after cessation of gross hematuria.
3. The history of occasional pain or discomfort in the right flank.
4. The palpable induration in position of the pelvic portion of the right ureter.
5. The impaired function of the right kidney.
6. The dilatation of the right pelvis and ureter.
7. The typical deformity in the outline and filling defect of the ureter shown in the pyelo-ureterogram.

The features enumerated warranted the positive diagnosis of "ureteral neoplasm—probably primary."

Operation was performed July 6, 1938. Because of the patient's stature and the low position of the right kidney it was possible to make the "nephro-ureteropartial cystectomy" through a single incision instead of through a flank incision and second incision in the lower abdomen as usualy employed. The incision was started below the tip of the twelfth rib and extended obliquely forward and downward in the lower quadrant to the midline a little above the level of the pubes. This gave adequate room to satisfactorily expose the kidney, whole length of ureter and adjacent bladder wall. The whole procedure was extra-peritoneal. An elliptical section of bladder wall measuring about 2 x 4 cm. with the attachment of ureter and ureteral orifice at its center was removed.

The postoperative course was uneventful.

The removed kidney, ureter and section of adjacent bladder wall are here for your inspection. Lantern slides of photomicrographs show the histologic appearance of the growth. It is a primary carcinoma of the ureter.

The first description of a case of ureteral tumor was by Rayer in 1841 but was not verified by histologic examination. In 1916 only seventeen cases of the condition had been reported. In 1934 the number had increased to only sixty-one verified cases. Two years later the total number of cases verified by histologic proof was ninety-six, indicating, of course, an increase of interest in the condition rather than any actual increase in the frequency of its occurrence.

How frequently primary neoplasm of the ureter occurs is impossible to say. Among 22,000 autopsy protocols of the Bellevue Hospital from 1904 to 1935 only one case of primary carcinoma of the ureter is noted. Among 22,181 patients in the Brady Urological Institute of Johns Hopkins Hospital there were only three cases of the condition. From these observations and from the scarcity of reported cases in the literature it is obvious that the condition is remarkably infrequent.

The symptoms of tumor of the ureter are quite variable. The classical triad of hematuria, pain and tumor mass are present in only a small proportion of the cases. The symptom most frequently prompting medical care is hematuria. The growth obstructs the ureter and usually produces some degree of hydroureter and hydronephrosis with accompanying pain. If the tumor is located in the upper two-thirds of the ureter, it will not be palpable until of considerable size. When located in the terminal portion of the ureter, it may, as in this case, be palpable relatively early.

Before the advent of pyelography the condition was recognized prior to operation in only about one-fifth of the cases.

### Discussion

DR. W. F. BRAASCH, Rochester: Dr. Foley is to be congratulated on making the clinical diagnosis in the case of primary tumor of the ureter that he reported. We have observed eighteen cases with primary tumor of the ureter at the Mayo Clinic and they are now being reviewed by Dr. Counseller and Dr. Cook, preparatory to reporting them. Of the eighteen cases, the preoperative diagnosis was made in only ten. In the last few years the accuracy of diagnosis has improved as the result of excretory urography. In two of our cases the patient was operated on for hydronephrosis and the tumor in the ureter was found subsequently. In another case the kidney was removed elsewhere for hydronephrosis. It is evident, therefore, that when pyelectasis is visualized in the excretory urogram, the site of ureteral obstruction should be determined and neoplasm excluded. Most of these tumors occurred among male patients. According to the degree of malignancy, seven tumors were graded 2, seven were graded 3, one was graded 1, and one was graded 4. An angiomatous tumor occluded the ureter in one case. Granuloma of the ureter may also occur and be large enough to simulate a neoplasm. Distinguishing primary tumors from secondary tumors of the ureter is an essential step in diagnosis. In two cases in which we made the diagnosis of tumor of the ureter, the lesion proved to be secondary to a primary papillary epithelioma of the renal pelvis, which we failed to find during the preliminary examination.

The prognosis in these cases has not been very good. Most of the eighteen patients were dead within three years after operation and several died in less than a year. It is possible that removal of the portion of the bladder surrounding the ureteral opening may give somewhat better results, but it is doubtful. That the condition is, fortunately, rare is shown by the fact that only eighteen instances were found at the Clinic in many thousand abdominal operations. Nevertheless, it does occur often enough so that one must be on the lookout for it.

DR. W. H. CONDIT (Minneapolis): What did the patients die of?

DR. BRAASCH: Early metastasis into the surrounding lymphatics.

DR. FOLEY: On October 12, approximately three months after operation, a small mass of induration high up in the right side of the pelvis could be felt on vaginal and rectal palpation. Whether this represents induration of the repair process or persistence or recurrence of the ureteral neoplasm cannot be said at this time.

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The meeting adjourned.

A. G. SCHULZE, M.D., *Secretary*

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## Meeting of December 14, 1938

The regular monthly meeting of the Minnesota Academy of Medicine was held at the Town and Country Club on Wednesday evening, December 14, 1938. Dinner was served at 7 o'clock and the meeting was called to order at 8:10 p. m. by the vice president, Dr. Carl B. Drake, in Dr. LaVake's absence. Forty-eight members were present.

Minutes of the November meeting were read and approved.

Upon ballot the following men were elected as candidates to active membership in the Academy:

**Dr. John Lepak.....Saint Paul**
**Dr. Kenneth Phelps .....Minneapolis**

This being the annual meeting, the following were elected as officers for the year 1939:

**President.....Dr. Carl B. Drake, Saint Paul**
**Vice President.....Dr. James Johnson, Minneapolis**
**Secretary-Treasurer.....Dr. A. G. Schulze (reëlected)**

The scientific program followed.

## FILTERABLE VIRUSES IN RELATION TO TUMORS AND MALIGNANT GROWTH

ROBERT G. GREEN, M.D.

University of Minnesota

*Minneapolis*

### Abstract

The principal defining characters of the ultramicrobes are a submicroscopic size and obligate parasitic growth within living cells. Their nature may be reasonably explained if it is recognized that the degenerative processes apparent in visible parasites are operative also in the world of microscopic parasites.

Typical of retrograde changes under conditions of parasitism are the modifications observed in the tapeworm, which, adapted to a parasitic existence in the gastrointestinal tract of animals, has entirely lost a digestive system of its own. It has long been my concept that bacteria and other microbes, in adapting themselves to parasitic life within cells, lose many vital functions which are available to them in the surrounding protoplasm, thereby become correspondingly smaller, and degenerate into the submicroscopic parastitic particles that we call filterable viruses.

In their adaptations filterable viruses are similar to bacteria and protozoa. To perpetuate their kind, viruses, like other parasites, must order their parasitic existence so as to gain a host, reproduce, and escape to a new host. The passage of the yellow fever virus through the mosquito is almost a duplicate of the complex adaptation of the malarial protozoan. It is recognized that the present status of the malarial parasite has been reached through a long series of evolutionary adaptations. The same appears true in the case of the ultravirus of yellow fever. Throughout their adaptations, viruses exhibit general properties common to the visible bacteria and protozoa.

Viruses as a group show a great diversity, and range from particles of visible size, and obviously closely related to microbes, down through submicroscopic particles approximating the size of large organic molecules. From this viewpoint, the viruses seem to be an extension of parasitic forms into the submicroscopic world through a series of intermediate sizes. Viruses, from these general considerations, appear to be biological species which maintain themselves as do pathogenic bacteria or protozoa and are attached to these visible microbes by intermediate forms.

It is now becoming evident that many proliferative lesions and tumors in animals are caused by viruses. The development by viruses of an ability to cause the cells in which they live to divide and expand their world of growth must be regarded as an adaptation favorable to the existence of viruses. The development of properties for an intracellular existence must depend upon a high degree of conformity of the physiologic processes of the parasite to those of the host cell. This is shown generally by the marked chemical inactivity of all obligate pathogens as compared with saprophytic bacteria.

The conformity of the physiologic processes of the intracellular parasite to those of its host, as an adaptation for parasitic existence, would probably, to a marked degree, be one of similarity. In the tangled metabolic processes of virus and host protoplasm, a proliferative virus might well substitute for a similar aggregate in protoplasm of the host and become anchored as a part of the cell. While this concept is speculative, investigations in this field are yielding information that supports some such concept. Rous has shown that the virus of the rabbit papilloma, which is demonstrable in the benign growth, cannot be obtained from the cancerous proliferation which often develops therefrom. Transplants of the cancer, however, appear to immunize against the virus. Kidd has found that from the Brown-Pearce carcinoma of rabbits a foreign antigen can be extracted which will give immune reactions with the blood of a rabbit afflicted with the tumor. Evidence of this type is accumulating which points to an intimate association of viruses with certain malignant growths, and seems to indicate that in these cases the virus is in some manner fixed within the malignant cell. At the present time research on viruses and their relation to tumorous growths is very productive. A concept of virus-fixation as a cause of malignant growths offers a possibility that at least cancers of a certain type may

sometime be prevented by immunization against viruses which cause precancerous lesions.

### Discussion

DR. MOSES BARRON (Minneapolis): Dr. Green's paper covers a very fruitful field for investigation since the origin of cancer is still undetermined. Because of the many different theories, one has to be very careful in drawing too strict conclusions.

Some twenty-five years ago Dr. Ervin Smith published a great deal on the production of plant cancer. He produced experimental tumors on various plants like crown-gall by the injection of the bacillus tumefaciens. At that time he brought out the parasitic theory of cancer, that is, that cancer is caused through the stimulation of cells by filterable viruses or bacteria. The work presented here tonight by Dr. Green is interesting in that he shows that certain types of papillomatous tumors in rabbits may be produced from the injection of what he considers a filterable virus obtained from such tumors. One has to think of the possibility that these tumors are produced from a simple irritation of some chemical substance. It is well known that certain chemicals, like tar, etc., will produce cancer when applied to the skin of different animals. I understand Dr. Green to say that not all animals inoculated with the filtrate of these papillomatous tumors develop papillomas. I believe he said that perhaps only one in a thousand or one in many thousand animals will result in cancer; that is, even if the tumors are produced, only a very small percentage will go on to the malignant stage. In animal experiments the cancer, therefore, may be not the direct result from the virus, but rather indirectly the result from the cellular proliferation which was brought about by the virus. There is one question which always comes to my mind whenever virus is presented as causing cancer. Since cancer cells develop from normal cells through a gradual transition during cellular proliferation, are we going to assume that the normal proliferation in growth and healing is also caused by a certain virus? Personally, I am not yet convinced that viruses in themselves produce cancer. Dr. Green's presentation is intensely interesting, but we must be careful in drawing too broad conclusions from results thus far obtained.

DR. F. R. WRIGHT (Minneapolis): A year ago in Philadelphia a paper was read at a research meeting giving the idea that malignant growths were due to protein colloid poisoning; that these individuals lived on protein-colloid-containing foods and that it was the over-use of the protein foods which tended to produce the growths.

DR. C. B. WRIGHT (Minneapolis): I would like to ask Dr. Green what progress has been made in can-


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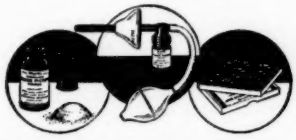

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cer studies from the standpoint of Dr. Rowntree's work on wheat germ oil?

DR. ARNOLD SCHWYZER (Saint Paul): I wonder about an experiment made by Lanz, later Professor of Surgery in Amsterdam, Holland; whether it would come in this study. The infectious character of a growth like a wart was accepted a long time ago by many. Lanz rubbed a wart into the skin of the back of his hand in a manner to form the letter "W." After some time one could see warty ridges on his hand in the form of the letter "W."

DR. GREEN (in closing): I did not intend to suggest that viruses are the cause of all proliferation. As parasites they take advantage of the proliferative property of cells and stimulate it for their own benefit. Certain insects are capable of stimulating proliferation of plant tissues to form a gall which serves as a favorable habitat for their offspring.

The request for further information about vitamin E and colloid malignancies I cannot satisfy, as I do not know how far this work has been extended since the reports mentioned.

The comments of Dr. Schwyzer regarding warts are very significant. Little work has been done in attempts to demonstrate that proliferative growths in human beings are due to viruses. It is recognized that a wart is one human proliferative lesion caused by a virus infection.

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## BOOK REVIEWS

**Books listed here become the property of the Ramsey and Hennepin County Medical libraries when reviewed. Members, however, are urged to write reviews of any or every recent book which may be of interest to physicians.**

YOU CAN SLEEP WELL. The A B C's of restful sleep for the average person. Edmund Jacobson. 269 pages Illus. Price $2.00. New York. Whittlesey House, 1938.

Confronted with the dilemma of sacrificing accuracy for palatability, the author has attempted in "You Can Sleep Well" to be all things to all men. One day while riding on a train, a phantom traveling salesman sold the author the idea of collaboration, which probably explains the hyperkinesis and hypertensiveness of the style of writing. In the first sixty pages, this traveling salesman is allowed to run rampant through doctors' offices and over golf fields seeking a cure for insomnia. He tries the gamut of "cures" from ovaltine to aspirin, but without success. Then in desperation, on the verge of a nervous breakdown, he tries the new method of "progressive relaxation," and finally gets his much needed sleep. If the lay reader has difficulty in finding the gold in this large, hard nugget, let him turn to pages 92, 103, 114, 121, 130 and read the instructions on how to relax carefully, and then if he still remains awake, turn to the last chapter on "How the body falls asleep."

The reviewer hopes that the second edition will be written in the simple clear style of his first book, "You Must Relax." MAX SEHAM.

* * *

ESSENTIALS OF OBSTETRICAL AND GYNECOLOGICAL PATHOLOGY. Douglass and Faulkner. St. Louis: C. V. Mosby Co., 1938.

Douglass and Faulkner, in their book on gynecological pathology, have composed an easily read manual covering the fundamentals of the subject. The book should be of especial value to students and to those practitioners who desire a quick, fairly comprehensive review of a specialized field. The text is well illustrated.

* * *

EXPERIENCES IN THE MANAGEMENT OF FRACTURES AND DISLOCATIONS. Philip D. Wilson, M.D. 1036 pages. Illus. Price, $5.00. Philadelphia: Lippincott, 1938.

This book is, without doubt, one of the most important works dealing with the fracture problem which has been published in recent years. It is not a textbook but is a series of monographs setting forth the experiences of a number of experts in the care of fractures. Over four thousand fractures and dislocations occurring on the fracture service of the Massachusetts General Hospital between the years 1923 and 1930 were studied and the final results were evaluated. Every case in which the end-result has been determined is summarized and the history, examination, the original treatment and the final treatment are given. At the end of each section there are the conclusions which have been arrived at as the result of the study of the individual type of fracture. The mere fact that a group of men have been willing to set down the unprejudiced account of their experiences in the care of their fractures without any regard to good or bad results is enough to recommend this book as a valuable addition to any surgeon's library.

GEORGE A. WILLIAMSON, M.D.

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